Imprimatur,

Tho. Tomkyns, *RR^mo in Christo Patri ac Domino D^no* Gilberto *Divinâ Providentiâ Archiepisc.* Cant. *à Sacr. Dom.*

Ex Æd. Lamb. *Maii* 2. 1668.

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PLUS ULTRA:

OR, THE

Progreſs and Advancement

OF

KNOWLEDGE

Since the Days of

ARISTOTLE.

In an ACCOUNT of ſome of the moſt Remarkable

LATE IMPROVEMENTS

OF

Practical, Uſeful Learning:

To Encourage

PHILOSOPHICAL ENDEAVOURS.

OCCASIONED

By a Conference with one of the *NOTIONAL* Way.

By *JOS. GLANVILL.*

LONDON,
Printed for *James Collins* at the *Kings-Head* in *Weſtminſter-Hall.* 1668.

TO THE

Right Reverend Father in GOD,

WILLIAM

Lord *Biſhop* of *Bathe* and *Wells*.

MY LORD,

'Tis a common, *and* vain *pretence in* Dedications, *That the* Name *of the Great Perſon is prefixed to keep off* Cenſure: *And if it would do* ſo *in earneſt, the Author might ſecure himſelf upon eaſie terms; and thoſe that write Books, need not* complain *ſo much of the*

A 2 Tongues

Tongues *of the* Envious, *and the* Ignorant: *But the worst on't is, they that use the* Courtship, intend *it for* no other; *and know, that they are no more* secure *under the* Title *of their* Patron, *than a Man in Battle is behind a* Target *made with a* Paper-Picture *of St.* George.

But, my Lord, *though I contemn those* silly, Romantick *kinds of* Flatteries, *yet I have a* real need *of your* Lordship's Name, *which, without this Vanity, I may use in my defence: since the* Angry Gentleman, *that gave occasion to the following Discourse,*

ſcourſe, hath uſurp'd *it to give* colour *to his* Reproaches. *What are the Particulars, I have told your Lordſhip, and have mentioned them in ſome of the neareſt enſuing Leaves. And ſince the* Man *of* Diſputations *hath accuſed me for an* Infidel, *and framed a Story concerning your Lordſhip to confirm it, I think it not ſufficient to confute the* Charge, *but muſt alſo ſhame the* Legend: *which, no doubt, your Name here prefixt, and the Aſſurance you were pleaſed to give me that it was not* true, *will do effectually.*

It becomes not me, my Lord, to suggest any Reflections *to kindle your displeasure for this* Invention, *to which certainly your Lordship owes no great Acknowledgments: But to decline all things that look like* Envy *or* Revenge, *I humbly implore on* his *behalf, your Pardon of the* Forgery; *and on* my own, *your* Permission *to deal with this* **Disputer.** This *perhaps some may judge a bold Offer, in* one *that pretends not great Matters, to undertake the* **Man** *of* **Gath**; *but I have no dread of the* formidable bulk *of his* Name *and Arms*

(*and*

(*and ſome think*, Moſt of the famed Giants, were indeed but Men of ordinary ſtature.) *For the Reputation of a* great Diſputant, *which my* **Aſſailant** *hath in this Country, it ſignifies no more with me, than that of a good* Cudgel-player, *or* Maſter *of* Fence: *and what this* **Doughty Man's** Art *and* Force *is, I have ſeen ſo much, as inſtructs me, that there is no great reaſon to apprehend* mighty Dangers *from his* Puiſſance. *My Lord, I have no contempt of any Mans Parts or Perſon, that keeps himſelf within the*

bounds of Modeſty and Civility: but for thoſe that are confident, imperious, abuſive, *and* aſſuming, *I confeſs 'tis hard for me to ſpeak of them with much* complement *or* reſpect.

And having taken the boldneſs to ſay all this, ſome perhaps may expect that I ſhould have the Duty *and* Juſtice *to ſay a great deal more; and that I ſhould celebrate your Lordſhip after the manner of* Dedications: *But I began with reproving* one *of thoſe* uſual Vanities, *and ſhall not end in the practice of* another. *Thoſe* Epiſtolary

Stolary Praiſes *are moſtly intended for* little, *and* go *for* nothing; *For* Flattery *and* Poetick Youth *have ſtrain'd them to ſuch a* ridiculous height, *that* Wiſe men *judge of them by the ſame meaſures, as they do the* Courtſhips *of* Common Amours. *I dare not therefore offer your* Gravity *and* Wiſdom *ſuch* vulgar *and* obnoxious Trifles; *but inſtead of thoſe* Fooleries, *I give your Lordſhip the ſerious aſſurance of my* affectionate *Duty, with the moſt grateful acknowledgment of your Favours. And that your aged*

Head may be Crowned with all the Blessings of a long Time, *and after* that, *with the full Glories of an* happy Eternity, *shall ever be the Prayer of,*

My Lord,

Your Lordships obliged and dutiful Servant,

JOS. GLANVILL.

THE

THE PREFACE TO THE REVEREND CLERGY OF THE Diocefs of *B.* and *W.*

FATHERS and *BRETHREN*,

THE *Reſpect* I owe you, and the *Relation* the following *Diſcourſe* hath to a *Reverend Man* of your Number, make me reckon my ſelf obliged, in point of *Civility* and *Decorum*, to give you an Account of this Engagement; Not that I think ſo meanly of YOU, or of my *Cauſe*, as to endeavour to *bribe* or *flatter* You into any *partiality* of *judgment* in my

my favour, which no doubt *You* would *disclaim*, and, I hope, I shall not *need*: But I judge an Information in some Particulars, may be necessary to a *free* and *unprejudiced Examination* of the things contained in these Papers. And I begin with the desire, That you would consider me as a Person that contemns all *Wranglings*, and *vehemencies* of *Dispute*; and there is somewhat of *Hell* in all Wars: Especially I dislike and lament all *Publick Controversies* among those of the *Sacred* Function, by which, great disrepute and reproach have been brought both upon *Them* and *It*; besides the other numerous Mischiefs they have done *Religion*, and the *Peace* of Men. And in those Differences, in which *eager Theologues* have been engaged, I have much pitied the *meanness* and *disorders* of their Spirits, in the *disingenuity*

ity and *violence* of their Assaults on one anothers *Reputations*, in which the *Question* was not concern-, but the *Cause* of each, much dis-rved by their respective abuses. By hich *Premisals*, You may perhaps ink, that I am drawing up a harge against my *own Discourse*, hich relates a *Controversie*, and *one* ith a *Divine*, that some possibly ay judge *too*, not to savour in the enage of it, of so much *Candour* nd *modest Sweetness* as I seem to ecommend. The *Answer* of *this*, ill be the *first* business of this PREFACE.

Therefore, for the *publishing* the *matter* of a *Dispute*, and *that* which was *privately* begun, I have to say, That the **Grave Man** gave me occasion enough of *Displeasure* and *Complaint*, by the *dreadful* and most *injurious Censure* of **Atheism**, charged

ged upon me, for saying no mo
than that [*The Scripture*
not Writ after the Way of ou
Methods; and, that God
those Holy Oracles did appl
himself much to the Imagina
tion of the Prophets.] Th
former of which Sayings, is so *eviden*
to one that considers the *Inspire*
Writings, that it will no doubt rea
dily be granted by *Wise men* of a
denominations in *Religion*; and
should much wonder it is by any
one made a *question*, but that we ar
fallen into an Age in which no
Truth and *Evidence* can secure any
thing from the *Captiousness* of *Dis*
puters. For the *other*, I have the
Suffrage of all that ever pretended to
understand any thing of the *Prophe*
tick Spirit, as I could at large make
appear, if I thought any needed *in*
formation

rmation and *conviction* in this mat-, beſides my **Reverend Anta-**
oniſt: Or, if I had neither *Evi-nce* nor *Authority* to vouch me in oſe Sayings; yet the Charge of **theiſm**, is like the bolt of one at throws *hard words* in *haſte*, and ithout aim or judgment.

So that I had cauſe enough to be ngry at an *Imputation* ſo little agree-ng with the *Diſcretion* of a *Wiſe man*, he *Charity* of a *Chriſtian*, or the *Ci-vility* of a *Gentleman*; And yet I did no more at firſt, but ſignifie to my *Aſſailant*, in a very *modeſt* and *mild* Letter, That I ſuppoſed he did not judge of me in his *cold* and *conſide-rate thoughts*, according to all that *ſeverity* he vented in the *heat* of *Paſ-ſion*, upon the account of which, I was ready to paſs by thoſe undeſer-ved *vehemencies* of Expreſſion, and to entertain a *civility* and *reſpect* for him.

him. This *Letter* the Grave Ma
received, but never returned me an
Answer, but what I had from *Pu*
lick Fame, which brought me dai
notice of his declaring me an Athe
ist in all *Places* and *Companies*. The
foul indignities for a while I though
my self obliged to bear *meekly*, as be
came a *Christian*, and *one* that taugh
others Patience; and accordingl
sate down quietly under the *infam*
of *that Tongue*, expecting when
would have spent its *fury*, and hav
done: But it was not content to vi
lifie me *abroad*, but come into m
Parish to wound me *nearer*, and af
fixt on me the same *horrid* imputati
on, before some of the People o
my Charge; as if my *Persecuter* had
designed, not only to *undo* my Re
putation, but also to defeat the *Suc*
ces of my *Labours*.

These Carriages I thought very

strange

strange, and very unbecoming *one* who Preacheth that Charity *that thinketh no Evil*; and yet still I bore, and did not *repay* in *kind*, hoping that *Time* and *greater matters* would at last have taken off the *fierce Assailant* from the *persecution* of my *Name*: But it seems the *Gentleman* could find nothing else so *powerfully* to ingage his Thoughts; and therefore he multiplied *Stories*, and set his *Invention* on work, when *Matter* failed. He gave out, That my *LORD BISHOP* **had writ him a Gratulatory Letter for his egregious Vindication of the Scriptures against me, and had also reproved my Atheism and Infidelity,** in **another.** I was glad he spoke good things of our *Reverend Diocesan*, though at my *Cost*: but *knew*, as to what concerned my self, that it was the overflowing

ing of his *good-will* towards the Bi*ſhop*, who never ſpake or writ a word to me of any ſuch matter. And for the *other part*, I ask'd his *Lord-ſhip*, and *he* was pleaſed to aſſure me, that he never underſtood any thing of ſuch a Buſineſs, before my inquiry Beſides which, he ſtoried, as I am credibly informed, That I had ſent him a **Recantation** (for that *interpretation* he made of the *reſpect* of my Letter) And if it had been *ſo* indeed, he hath much added to the credit of his own *Ingenuity* and *Veracity*, in publiſhing me for *that*, which he ſaith I have *retracted* and *diſowned*.

When therefore I ſaw, that a *little Truth*, which gave the colour and occaſion, and a great deal of what was not ſo, for which there was no reaſon, were ſet on work to beſpatter and traduce me; When I perceived

ved that my *Patience* was abuſed, and my *Civility* made an *Argument* of *Cowardice* and *unmanly Compliance*; When I ſaw my *Name expoſed* (for which I ought to have a concernment upon another account, beſides that of *Self-love*) and the *Effect* of my *Miniſtry* like to be hindred by my *ſilence* and *tameneſs* under thoſe *Peproaches*; I thought it a *duty* both to my ſelf, and thoſe of my Charge, to give *Publique Accounts* of the whole Matter, that they who are capable of judging, may ſee how little cauſe ſome men have for their *railing Inſultations* and *Triumphs*.

I therefore reſolved to prepare a *Letter*, I had writ to a private Friend about it, for the *Publick*; and I have in ſuch a way ordered my *Caſtigations*, that they make up a *Diſcourſe* upon a very *ſeaſonable* and *general Subject*: So that my **Aſſailant** hath

only given the occasion of the *Method*. And so *tender* I am of troubling others with my *personal Matters*, that I suffered my thoughts several times to *cool*, and should perhaps have *reduced* my mind to an *idle indifferency* under those former *Slanders*, had not my **Reverend Adversary** taken care to *quicken* the *laziness* of my *Humour*, and to *warm* my intentions of proceeding, by the *continued abusive liberty* of his *Language*; the report of which, daily coming to my ears in *fresh gusts* as I was writing, did I confess excite in me a great *contempt* of that kind of *Spirit*, and occasioned me to express less *deference* and *respect*, than otherwise I should have done to *this* **Assailant.** *This* I mention for *your pardon*, because of *his Profession*; the consideration of which indeed did urge me sometimes to *more indigna-*

tion,

ion, when I reflected, how unlike ſuch *rough, injurious demeanour* was, to what may be expected from thoſe that Miniſter in the *Goſpel* of *Peace* and *Love*. So that though I am one that reſent a certain *ungentility* (beſides the other unhandſom things) in *bitterneſs* of *Expreſſion*, yet I thought *ſmartneſs* of *reproof* to be *here neceſſary* and *ſeaſonable*. And whoever ſhall conſider the *mild* carriage of my Pen, when 'twas ingaged in a *Defence* of one of my Books, againſt the Aſſault of the Famous *ALBIUS*, will ſee there, that I uſe it not as an *Offenſive Weapon* of *War*, and that my *Humour* is not *fierce* and *abuſive*. I therefore crave your candour in thoſe *Periods*, where I may ſeem leſs *ſmooth* to my *angry Antagoniſt*; for I think it not proper to *Complement*, when he *Strikes*. And yet I am not at *eye for*

eye, and *tooth for tooth*; nor do I ſtudy *ſtrict retribution*: But having a great *Averſion* in my *Nature* and my *Principles*, to the **rude, diſputing, cenſorious**, and **implacable** Spirit, cannot forbear giving my *Style* a *tincture* of the *diſeſteem*, not to ſay *contempt*, I have for *that Genius*.

I had here added ſome other things, which I thought fit for your notice, concerning the *Matter* of the *black Charge*; and *ſuch* as I conceive will help me to a better place in your thoughts, than the **Diſputer** would provide for me: But thoſe *Conſiderations* would have ſwell'd this *Preface* to a *diſproportionate* bulk; and therefore I have caſt them into the latter end, where I hope you will take the pains to find them, and do me, and others that may be concerned, *that right*, as to weigh deliberately thoſe *Apologetical Remarques*.

And

And having signified this my desire, I proceed to observe what more nearly relates to the main Subject of the *Discourse* it self, the *chief design* of which is, to encourage the *freer* and *better* disposed Spirits, to *vigour* and *endeavour* in the *pursuits* of *Knowledge*; and to raise the *capable* and *ingenuous*, from a *dull* and *drowsie acquiescence* in the *Discoveries* of former Times; by representing the great *Encouragements* we have to proceed, from *modern Helps* and *Advancements*. Of these I have given some *Instances* in the more *remarkable Particulars*: For I intend not a *full* and *accurate History* of all the late *Improvements* of *Science*; but so much as may serve my aim of confuting the *fond* Saying of my **Antagonist**, and exciting of *Philosophical Endeavours*. In which, I confess, I had a principal eye upon the *ROYAL SOCIETY*,

and the *Noble* Purposes of that *Illustrious Assembly*, which I look upon as the great *ferment* of *useful* and *generous* Knowledge; and have said enough, I think, to justifie *that Apprehension*, in the following Sheets. And because some *pious* men are afraid of an *Institution* they have heard but imperfectly of, and are *jealous* of what they have not had opportunities to understand, I have therefore given a *succinct* Account of the *Reason*, *Nature*, and *Designs* of *that Establishment*, for the information of such as have not met with their *Excellent HISTORY*. Besides which, I think fit to add here, That *WE* of the *CLERGIE* have no reason to apprehend *danger* from that *Constitution*, since so many *Pious*, *Learned*, and *Excellent* Persons of our Order, are *Members* of *that Body*. And for the prevention

of

of those *panick*, *causeless Terrours*, I shall take the boldness here to name some of those *Venerable* and *Worthy Ecclesiasticks*. I find therefore in their Catalogue, The *Most Reverend* the *Lords Archbishops* of *CANTERBURIE* and *YORK*, The *Right Reverend* the *Lords Bishops* of *ELY*, *LONDON*, *ROCHESTER*, *SARUM*, *WINTON*; and those other Reverend Doctors, Dr. *John Wilkins Dean* of *RIPPON*, Dr. *Edward Cotton Archdeacon* of *CORNWALL*, Dr. *RALPH BATHURST President* of *Trin. Coll. OXON.* Dr. *John Pearson Margaret Professour* of *CAMBRIDGE*, Dr. *John Wallis Professor* of *Geometry* in *OXFORD*, Dr. *William Holder*, Dr. *Henry More*, Dr. *John Pell*; and I reserve for your nearer notice, an excellent Person of your Neighbourhood and Number,

Dr. *John Beale*, who in an Age that uſually *cools* and *ſinks*, as to the more active Deſigns, doth yet retain the *vigour* and *vivacity* of *ſprightly youth*, with the judgement of the *ripeſt* years, and is unwearied in the nobleſt *Activities* and moſt *generous Proſecutions*.

And now I hope that there is none of *you* guilty of ſo great an *immodeſty* and *irreverence*, as to judge *thoſe Deſigns* to have *an evil Aſpect* upon *Religion*, which are *ſubſcribed* and *promoted* by ſo many *great* and *grave Divines*, of ſuch known *Piety* and *Judgment*. And the mention of thoſe Celebrated Names, may ſerve to remove another groundleſs ſuſpicion which ſome have entertained, *viz.* That the *Univerſities* are undermined by this new *Philoſophick Society*: For whoever phancieth or ſuggeſts *that*, caſts a *black Character* upon

upon the *ſagacity* and *faithfulneſs* of thoſe *Reverend* Men, who all have been *Eminent Members* of one or other of thoſe *Schools* of *Learning*; and moſt of them do ſtill retain a Relation to thoſe *ancient* and *venerable* Bodies.

But to ſuperſede further Diſcourſe about this here, I owe ſome things elſe to my ſelf, which is to anſwer the *Objection*, of my oppoſing the great Name of *ARISTOTLE*. Concerning it, I have ſaid *ſome things* in this *Book*, and *more* in *others*; For the preſent therefore I ſhall content my ſelf to ſuggeſt, That I am very ready to give chearful Acknowledgements to his *Rhetorick*, *Hiſtory of Animals*, and *Mechanicks*, and could wiſh that theſe were more ſtudied by his *devoted* Admirers: But for the *notional* and *diſputing* parts of his *Philoſophy*, it hath deeply

Dr. *John Beale*, who in an Age that uſually *cools* and *ſinks*, as to the more active Deſigns, doth yet retain the *vigour* and *vivacity* of *ſprightly youth*, with the judgement of the *ripeſt* years, and is unwearied in the nobleſt *Activities* and moſt *generous Proſecutions*.

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ly troubled me, when I have considered how much they have taken up that Time, and those Endeavours, which should have been imployed in surveying the *Works* of *GOD*, that magnifie and discover their *Author*, from which only the *true Philosophy* is to be obtained: And the zeal I have for the *Glory* of the Almighty discovered in his *Creatures*, hath inspired me with some smartness and severity against those *Heathen Notions* which have so unhappily diverted Learned men from the study of *Gods GREAT BOOK*, *UNIVERSAL NATURE*; and consequently, robb'd *Him* of that *Honour*, and those *Acclamations* that are due to him, for those admirable Results of his *Wisdom* and *Goodness*.

And now 'tis high time to draw up to the last Requests I have to

You,

You, which are, That you would pleaſe to do me that right, *deliberately* to weigh my following accounts, which though I have deſigned to expreſs with all imaginable *perſpicuity* and clearneſs, yet I cannot expect that they ſhould preſently enter into Minds, that moſt ordinarily converſe with another ſort of Matters, upon an *haſty* and *careleſs peruſal*. I ſay therefore, I appeal to the *reflecting* and *conſiderate* thoughts of *attentive* and *judicious* men, But for the hair-brain'd half-witted Cenſurers, that only tell the Leaves of Books, and paſs *Definitive Sentences* at a venture, I except againſt their *Verdicts*, and contemn them.

You ſee upon the whole, that I have dealt *openly* with my **Antagoniſt**, and have ſaid all to himſelf and the Publick, and more than ever I did on any private occaſion: Though

Though I believe, that *he* that hath endeavoured *skulkingly* and by *envious Arts* to traduce me, would be aſhamed to own *that* in the *face* of the *light*, and *mine*, which he hath reported in *corners*. Whether he intends to anſwer my *Relations* and *Reflections*, or ſit down in a **grave ſilence**, I cannot tell. If he doth the *former*, I look that he ſhould ſhew, *either that there are no ſuch Inſtances of Improvement in Knowledge, ſince* Ariſtotle, *as I have reckoned*; or, *That they are no Advantage for the Increaſe of* SCIENCE. If he proves either of theſe, his *Return* will be an *Anſwer*; and I ſhall admire his *Wit* in an *eternal reſpect* and *ſilence*: But if he offers any thing elſe for

a *Reply*, I appeal to *you*, whether it be like to be to purpoſe? or, whether I ſhall have any need to trouble my ſelf to rejoyn to an *impertinence*? But on the other hand, if his **Sageneſs** reſolve to ſit down, and *gravely* to ſay nothing in Return (which 'tis like his Wiſdom will counſel him to be beſt) I expect from ſuch an *Ingenuity* as *his*, that he ſhould fall again to his *little arts* of *Calumny*, and deal with my *Book* as he hath with my *Perſon*, aſſault it *behind* with *dirt* and *hard-names*, and confute *it* with a *Piſh*, or a great word or two, among his private Admirers. This no doubt will be the eaſieſt way of Anſwering; and thoſe that have got *great Reputation* by **Artifice, Chance, Vapouring**, or the **Ignorance** of thoſe they converſe with, have commonly the *prudence* not to put it to the *hazard* of *publick Tryals*. I do

not

not ſay, this is the Caſe of the **Reverend Diſputer**; let thoſe that *know, judge.*

However 'tis, my Antagoniſt being of long ſtanding in theſe Parts, is like to have the *wind* here; and whether his *Reply* be *publique* or not, I reckon he will blow the *DUST* upon me: but if I have the *SUN*, as I hope, I ſhall have no reaſon to regret his Advantage. The Truth is, I deſire to conflict in an open *Champaigne*, where there may be leſs danger of *guile*, *treachery*, and *ambuſh*: But I perceive my Adverſary is for fighting in **Dirty-lanes** and among the **Cole-pits**, like the *Iriſh* among their *Boggs*. Let him enjoy the *Empire* of *Learning* in thoſe Places, and whatever *Triumphs* over me he pleaſeth. If YOU, Sirs, and the intelligent World favour the *Juſtice* of my Cauſe, which, with-

out diſparagement to *yours* I cannot doubt, I have enough, and ſhall be content to permit the **Diſputer** to *clap* his *Wings*, and *crow* at home, till he be *aſhamed* and weary of his *fond* and *cauſeleſs Orations*.

Theſe are the things I thought fit to premiſe to my *Diſcourſe*, to which now I remit your Eyes, without adding more, but the Reſpect and Service of,

Reverend Sirs,

Your humble Honourer and Servant,

J. G.

Modern Improvements OF USEFUL KNOWLEDGE.

To a Friend.

CHAP. I.

The INTRODUCTION.

SIR,

THE *Inquiry* of your laſt was very *obliging*, as it ſignified an *affectionate* concernment for me: And in teſtimony of my reſentment of the Kindneſs, I ſhall be *large* and *particular* in my Return; which I intend as full as my Affairs will permit, becauſe I owe you ſome Account of the *Modern* way of *Philoſophy*, and the *ROYAL Colledge* of *Philoſophers*:

And I do not yet know, but that I may have an occasion of making these things publick. Not that I am so fond to think my *little Contrasts* fit subject for *general* Entertainment; nor am I so tender and over-weening, as to make it a *business* to complain in Print of my private Injuries: But I foresee, the *Relation* I am about will afford me fit and ample opportunity to discourse things, which perhaps you may think worth your labour to *consider*. And what I have to say, tends either to the direct recommendation of the ways of *Useful Knowledge*, or to the detecting the *immorality*, *weakness*, and *vanity* of the *Spirit* that opposeth it.

Briefly then, as to your Inquiry about the Conference I had with the **Grave Person** you mention; You may please to know, That not long since I lighted into the Company of that *Reverend Man*, who, I suppose you have heard, hath a Reputation for Learning among his *Neighbours*, and is accounted a **Philosopher** in the **Peripatetick way**. I was glad of an opportunity of his Acquaintance, and approach'd him with that respect which I judged due to a person of that *Gravity*, and of whom I had heard *advantageously*.

He

He had been speaking before I came, about *Aristotle* and his *Philosophy*; And after our first Civilities were over, he renewed the Discourse, and applied it all to me. I confess I was not willing to begin an Acquaintance in a *Dispute*, in which I foresaw there might be danger of *heat* and *animosity*. This I intimated, and would have declined the occasion; because, though I love *modest* and *temperate* Discoursing, yet I am a *profess'd* Enemy to all *captious* and *resolv'd Oppositions*, which for the most part run into *wild Rambles*, and end in *Quarrels*. But the Gentleman, it seems, had *warm'd* himself by the concernment he took in the Discourse, and was forward to prosecute the Argument in *vindication* and *praise* of *Beloved Aristotle*: Which Carriage, though I thought somewhat too young for the *Gravity* of that *Appearance*, and more becoming the *pertness* of a *Sophister*, than the *Sageſs* of a *Reverend Divine*; yet I abstain'd from any *displeasing Reflection*, and should quietly have permitted him to have satisfi'd himself in his *Venerations* of that *Name*, without interruption or disturbance: For I count it not *civil* to trouble any One in his *Worship*, or to profess to his face, a *contempt* of another Mans *GODS*.

But the Grave *Gentleman* could not be content only to celebrate and admire his *Ariſtotle*; but was pleaſed to take an occaſion to make *Compariſons*, and to *diminiſh* the *ROYAL SOCIETY*. This Paſſage, I confeſs, I thought not handſom. And methinks the *Reverence* we owe to the *ROYAL FOUNDER* and *PATRON* of that *Eſtabliſhment*, and the Reſpect that is due to *PRINCES*, *PRIVY COUNSELLORS*, and *PRELATES*; to the moſt *Learned* Men of all Sorts and Profeſſions, *Mathematicians*, *Chymiſts*, *Phyſicians*, *Anatomiſts*, *Antiquaries*, and *Philoſophers*; to the *PRIME NOBILITY*, and ſo many of the *Learned* and *Ingenious* amongſt the *GENTRY*: I ſay, I thought that the Regard, which is a debt to ſuch Perſons as make up that *Honourable Aſſembly*, had been enough to procure it *Civil uſage* among all that had but an *indifferent* proportion of *Modeſty* and *Breeding*. And if there were nothing elſe to oblige men to Reſpectful Diſcourſe of this *Generous Company*, I ſhould think the Conſideration of their Noble Aims, which no doubt are ſome of the *Greateſt*, moſt *Auguſt*, and moſt *Hopeful* that *ever were*, ſhould be ſufficient to obtain them at leaſt

good

good words from all that are capable of understanding their *Catholick* intendments and prosecutions. And these, Sir, are not the little Projects of *serving* a *Sect*, or *propagating* an *Opinion*; of *spinning* out a *subtile Notion* into a *fine thred*, or forming a *plausible System* of *new Speculations*: but they are Designs of making *Knowledge Practical*, and *accommodating Mankind* in things of *Universal Benefit*, by searching into the *Creatures* of *God* as they are in his *World*, and not *criticizing* upon the *Images* of *them* as they lye in *that* which the *Phansies* of *Men* have *contriv'd*. This my *Reverend Assailant* either did *not know*, or did *not consider*. But supposing that this *Society* had a design against *adored Aristotle*, or not so great an apprehension of him as he had been wont to instil into his *Pupils*, thought fit to bring *it* under his *Corrections*; and at his disrespectful Discourse of that *Assembly*, I felt my self concerned.

I therefore took occasion to speak from somewhat he had newly said, which was to this purpose, [**That** Aristotle **had more Advantages for Knowledge than the** ROYAL SOCIETY **or all the present Age had, or could have**; and for this *strong* Reason,

because he did totam peragrare Asiam.] This, Sir, you perceive was said in *haste*, when *Consideration* was not at home. And I was much surprised to hear an Assertion from one that had not lived in a Cell, which were scarce excusable in a *Recluse*, who had seen or known nothing of the World, but the *Antique Venerable Images* of a *Religious House*. And you will be sensible of the *injustice* and *incogitancy* of this saying, and conceive better things of the later Ages, when you reflect and think how many. ***Arts***, ***Instruments***, ***Observations***, ***Experiments***, ***Inventions*** and ***Improvements***, have been discloſed to the World since the days of *Aristotle*, which are *vast* ***Advantages*** for ***Knowledge***, and all *Noble* and *Useful Inquiries*.

But before I come to instance in these Particulars, I must premise, That the *ROYAL SOCIETY*, and those of that *Genius*, are very ready to do right to the *Learned Ancients*, by acknowledging their *Wit*, and all the *useful Theories* and helps we have from them: but they are not willing

ling that *those*, however *venerable Sages*, should have an *absolute Empire* over the *Reasons* of *Mankind*. Nor do they think, That all the *Riches* of *Nature* were discovered to some *few particular Men* of former Times; and that there is nothing left for the *benefit* and *gratification* of after-Inquirers. But *They* believe, There is an *inexhaustible variety* of *Treasure* which *Providence* hath lodged in Things, that to the Worlds end will afford *fresh Discoveries*, and suffice to reward the *ingenious Industry* and *Researches* of those that *look* into the *Works* of *God*, and *go down to see his wonders in the deep*. This, no doubt, the *modesty* and *justice* of the *Ancients* themselves would have confess'd. But besides this, the *Modern Experimenters* think, That the *Philosophers* of elder Times, though their *Wits* were excellent, yet the way they took was not like to bring much *advantage* to *Knowledge*, or any of the *Uses* of *humane Life*; being for the most part *that* of *Notion* and *Dispute*, which still runs round in a *Labyrinth* of *Talk*, but *advanceth nothing*. And the *unfruitfulness* of those *Methods* of *Science*, which in so many *Centuries* never brought the World so much *practical*, *beneficial Knowledge*, as would help towards

the *Cure* of a *Cut finger*, is a palpable Argument, That they were *fundamental Miſtakes*, and that the *Way* was not *right*.

For, as my Lord *Bacon* obſerves well, *Philoſophy*, as well as *Faith*, muſt be *ſhewn* by its *Works*. And if the *Moderns* cannot ſhew more of the *Works* of *their Philoſophy* in *ſix years*, than the *Ariſtoteleans* can produce of *theirs* in more than *thrice* ſo many *hundred*, let them be loaded with all that *Contempt* which is uſually the *reward* of *vain* and *unprofitable Projectors*. But now, That this *Procedure* hath effected more for the *information* and *advantage* of Mankind, than all the Ages of *Notion*, the *Records* of the *Royal Society* alone are a ſufficient Evidence (as the World will ſee, when they ſhall think fit to unfold their *Treaſure*.) I ſay then, the *Modern Philoſophers* arrogate nothing to their own *Wit*, above that of the *Ancients*: but by the *reaſon* of the *thing*, and *material*, *ſenſible Events*, they find they have an advantage by their *Way*. And a *lame Child* that *ſlowly* treads the *right Path*, will at laſt arrive to his Journeys end; while the *ſwift Footman* that *runs* about in a *Wood*, wil *loſe* himſelf in his *wandrings*.

CHAP.

Chap. II.

The Ways *of improving Useful Knowledge proposed. The* Advantages *this Age hath from the great advancements of* Chymistry *and* Anatomy,

AND having said *this*, I come to encourage your *hopes* in the *present Philosophical* Endeavours; and to discourse more *largely*, what I could but suggest to the **Reverend Disputer.** And here I am to represent in as many material *Particulars* as I can now call into my thoughts, the *Advantages* for *Useful Knowledge*, which the *later Ages* have beyond *those* of the days of *Aristotle*, and *remoter Antiquity*. And in order to this, I consider,

That there are *Two* chief ways whereby *Knowledge* may be *advanced*, viz. (1.) By inlarging the *HISTORY* of Things: And (2.) By *improving INTERCOURSE* and *COMMUNICATIONS*. The *HISTORY* of Nature is to be *augmented*, either by an *investigation* of the *Springs* of *Natural Motions*, or *fuller Accounts* of the

the *groſſer* and more *palpable Phænomena*. For the ſearching out the *beginnings* and *depths* of *Things*, and diſcovering the *intrigues* of *remoter* Nature, there are *THREE* remarkable *ARTS*, and multitudes of excellent *INSTRUMENTS*, which are great Advantages to theſe *later Ages*; but were either not at all *known*, or but *imperfectly*, by *Ariſtotle* and the *Ancients*. The *ARTS* in which I inſtance, are *CHYMISTRY*, *ANATOMY*, and the *MATHEMATICKS*: The *INSTRUMENTS*, ſuch as the *MICROSCOPE*, *TELESCOPE*, *THERMOMETER*, *BAROMETER*, and the *AIR-PUMP*: *Some* of which were *firſt Invented*, *all* of them exceedingly *Improved* by the *ROYAL SOCIETY*.

TO begin with the Conſideration of the *ARTS* mentioned, I obſerve, That *theſe* were very little cultivated or uſed in *Ariſtotles* Times, or in *thoſe* following ones in which his *Philoſophy* did moſt obtain.

For the FIRST, *CHYMISTRY*, it hath indeed a pretence to the great *Hermes* for its *Author* (how *truly*, I will not diſpute) From *him* 'tis ſaid to have

ave come to the *Ægyptians*, and from em to the *Arabians*; Among *these* it was finitely mingled with *vanity* and *superstiious devices*: but it was not at all in *use* ith *Aristotle* and his *Sectators*. Nor doth it appear that the *Grecians*, or the *disputing Ages*, were conversant in these *useful* and *luciferous Processes*, by which *Nature* is *unwound*, and *resolv'd* into the *minute Rudiments* of its *Composition*; and by the *violence* of those *Artful Fires* it is made *confess* those *latent* parts, which, upon *less provocation*, it would not *disclose*. And now, as we cannot understand the *frame* of a *Watch*, without taking it into pieces; so neither can Nature be well *known*, without a *resolution* of it into its *beginnings*, which certainly may be best of all done by *Chymical Methods*. And in those *vexatious Analyses* of Things, *wonderful discoveries* are made of their Natures, and *Experiments* are found out, which are not only full of *pleasant surprise* and *information*, but of *valuable use*, especially in the *Practice* of *Physick*; For It directs *Medicines* less *loathsome* and far more *vigorous*, and freeth the *Spirits*, and *purer* parts, from the *clogging* and *noxious appendices* of *grosser* matter, which not only *hinder* and *disable*

the

the *Operation*, but leave hurtful *dregs* i
the Body behind them. I confeſs, Sir, tha
among the *Ægyptians* and *Arabians*, th
Paracelſians, and ſome other *Moderns*
Chymiſtry was very *phantaſtick*, *unintelligi*
ble, and *deluſive*; and the *boaſts*, *vanity*
and *canting* of thoſe *Spagyriſts*, brought a
ſcandal upon the *Art*, and expoſed it to
ſuſpicion and *contempt*: but its late *Cultiva-*
tours, and particularly the *ROYAL SO-*
CIETY, have refin'd it from its *droſs*,
and made it *honeſt*, *ſober*, and *intelligible*,
an excellent *Interpreter* to *Philoſophy*, and
help to *common Life*. For *they* have laid
aſide the *Chryſopoietick*, the *deluſory Deſigns*
and *vain Tranſmutations*, the *Roſie-crucian*
Vapours, *Magical Charms*, and *ſuperſtiti-*
ous Suggeſtions, and form'd it into an *In-*
ſtrument to know the *depths* and *efficacies* of
Nature. This, Sir, is no ſmall advantage
that we have above the *old Philoſophers* of
the *Notional way*. And we have another,

(2.) In the *Study*, *Uſe*, and *vaſt Im-*
provements of *ANATOMY*, which we
find as needful to be *known* among *us*, as
'tis wonderful 'twas *known* ſo little among
the *Ancients*, whom a fond *Superſtition* de-
terr'd from *Diſſections*. For the *Anatomi-*
zing the *Bodies* of *Men*, was counted *bar-*
barous

barous and *inhumane* in *elder Times*: And I observe from a Learned Man of our own, That the *Romans* held it unlawful to *look* on the *Entrails*. And *Tertullian* severely censures an inquisitive Physician of his time, for this *practice*, saying, That *he hated Man, that he might know him*. Yea, one of the *Popes* (I take it 'twas *Boniface* 8.) threatens to *Excommunicate* those that should do any thing of this *then-abominable* nature. And *Democritus* was fain to excuse his *Dissection* of *Beasts*, even to the great *Hippocrates*. Nor does it appear by any thing extant in the Writings of *Galen*, that *that* other *Father* of *Physicians* ever made any *Anatomy* of *humane* Bodies. Thus *shie* and unacquainted was *Antiquity* with this excellent *Art*, which is one of the most *useful* in humane Life, and tends mightily to the *eviscerating* of Nature, and discloſure of the *Springs* of its *Motion*. But now in these *later* Ages, *Anatomy* hath been a *free* and *general Practice*; and particularly in *this* it hath received *wonderful Improvements* from the Endeavours of several worthy Inquisitors, some of them Ingenious Members of the *ROYAL SOCIETY*, as Sir *George Ent*, Dr. *Glisson*, and Dr. *Willis*. I instance in the most *remarkable* of their

Discoveries

Diſcoveries briefly; And thoſe I take notic
of are, The *Valves* of the *Veins*, diſco
ver'd by *Fabricius ab Aquapendente*; Th
Valve at the entrance of the *gut Colon*
found, as is generally thought, by *Bauhinus*
The *Milkie Veins* of the *Meſentery*, by *A*
ſellius; The *Receptacle* of the *Chyle*, b
Pecquet; and the *Lacteæ Thoracicæ*, by th
ſame Diſcoverer; The *Glandulæ Lacte*
Lumbares, by *Bartholin*; A *new Ductus* i
the *Teſticles*, by Dr. *Highmore*; The *Du-*
ctus Virſungianus, by *Jo. George Wirſung* o
Padua; The *Lymphatick Veſſels*, by Dr.
Joliffe, *Bartholin*, and *Olaus Rudbeck*; The
internal Ductus Salivaris in the *Maxillary*
Glandule, by Dr. *Wharton*, and Dr. *Gliſſon*;
The *external Ductus Salivaris* in the *con-*
glomerated Parotis, The *Ductus* of the *Cheek*;
The *Glandules* under the *Tongue*, *Noſe*, and
Palate, The *Veſſels* in the nameleſs *Glandule*
of the *Eye*, and the *Tear-Glandule*, by *Nich.*
Steno; The *Sinus* of the *Veins*, and their
Uſe, by Dr. *Willis*; The *Ductus Renales*, by
Laurentius Bellini; A new *Artery*, called
Arteria Bronchialis, by *Fred. Ruyſch.* I add,
the *Origination* of thoſe *Nerves* which
were of old ſuppoſed to ariſe out of the
ſubſtance of the *Brain*, but are found by
late *Anatomiſts* to proceed from the *Medull.*
Oblongata,

Oblongata. And though the *Succus nutritius* be not yet fully agreed upon by *Physicians*, yet it hath so much to say for it self, that it may not unreasonably be mentioned among the *New Inventions.*

But of all the *modern Discoveries*, *Wit* and *Industry* have made in the *Oeconomy* of *humane Nature*, the Noblest is that of the *Circulation* of the *Blood*, which was the Invention of our deservedly-famous *Harvey.* 'Tis true, the *Envy* of *malicious* Contemporaries, would have robb'd him of the Glory of *this Discovery*, and pretend it was known to *Hippocrates*, *Plato*, *Aristotle*, and others among the Ancients: But whoever considers the Expressions of those Authors, which are *said* to respect the *Circulation*, will find, that those who form the *Inference*, do it by a *faculty* that makes all *kind* of *Compositions* and *Deductions*, and the *same* that assists the *Enthusiasts* of our days to see so clearly all our Alterations of *State* and *Religion*, to the *minutest Particulars*, in the *Revelation* of St. *John.* And I think it may be as well concluded from the *first Chapter of Genesis*, as from the *Remains* of those *Ancients*; *who*, if they had known this *great* and *general Theory*, how chance they spake no more of a thing, which no doubt

doubt they had frequent occaſions to mention? How came it to be *loſt* without memory among their Followers, who were ſuch *ſuperſtitious porers* upon their Writings? How chance it was not ſhewn to be lodg'd in thoſe Authors, before the days of Dr. *Harvey*, when *Envy* had *impregnated* and determined the *Imaginations* of thoſe, who were not willing any thing ſhould be found anew, of which themſelves were not the *Inventors*? But 'tis not only the *remoteſt* Ancients, whom time hath *conſecrated*, and *diſtance* made *venerable*, whoſe *Aſhes* thoſe fond men would honour with *this Diſcovery*: but even much *later* Authors have had the glory faſtned upon them. For the *Invention* is by ſome aſcribed to *Paulus Venetus*; by others, to *Proſper Alpinus*; and a third ſort give it to *Andreas Cæſalpinus*. For *theſe*, though either of them ſhould be acknowledged to be the Author, it will make as much for the deſign of my Diſcourſe, as if *Harvey* had the credit; and therefore here I am no otherwiſe concerned, but to have *Juſtice* for that Excellent Man: And the World hath now done *right* to his *Memory*, *Death* having overcome that *Envy* which *dog's living Virtue* to the *Grave*; and his *Name* reſts

rests quietly in the Arms of *Glory*, while the *Pretensions* of his *Rivals* are *creeping* into *darkness* and *oblivion.*

Thus, Sir, I have done with the *Instances* of *Anatomical Advancements*, unless I should hitherto refer the late Noble *Experiment* of *Transfusion of the Blood* from one *living Animal* into *another*, which I think very fit to be mention'd; and I suppose 'tis not improper for this place: Or however, I shall rather venture the danger of *impropriety* and *misplacing*, than omit the taking notice of so excellent a Discovery, which no doubt future *Ingenuity* and *Practice*, will improve to purposes not yet thought of; and we have very great likelihood of Advantages from it in *present prospect.*

For it is concluded, That the greatest part of our Diseases arise either from the *scarcity*, or *malignant tempers* and *corruptions* of our *Blood*; in which cases *Transfusion* is an *obvious Remedy*; and in the way of this Operation, the *peccant Blood* may be drawn out, without the danger of too much *enfeebling* Nature, which is the grand inconvenience of *meer Phlebotomies.* So that *this Experiment* may be of excellent use,

when *Cuſtom* and *Acquaintance* have hardned men to permit the Practice, in *Pleuriſies*, *Cancers*, *Leproſies*, *Madneſs*, *Ulcers*, *Small-Pox*, *Dotage*, and all ſuch like Diſtempers. And I know not why *that* of *injecting prepared Medicines* immediately into the Blood, may not be better and more efficacious, than the ordinary courſe of Practice: Since this will prevent all the danger of fruſtration from the *loathings* of the *Stomach*, and the diſabling, clogging mixtures and alterations they meet with *there*, and in the *Inteſtines*, in which no doubt much of the *Spirit* and *Virtue* is *loſt*. But in the way of *immediate injection*, they are kept *intire*, all thoſe inconveniences are avoided, and the *Operation* is like to be more *ſpeedy* and *ſucceſful*. Both theſe *noble Experiments* are the late *Inventions* of the *ROYAL SOCIETY*, who have atteſted the *reality* of the former, *that* of *Tranſfuſion* of *Blood*, by numerous Tryals on ſeveral ſorts of *brute Animals*. Indeed the *French* made the *Experiment firſt* upon *humane Bodies*, of which we have a good account from *Monſieur Dennis*: But it hath alſo ſince been practiced with fair and encouraging ſucceſs, by our *Philoſophical Society*. The *other* of *Injection*, if it may be

be mentioned as a different Invention, was also the product of the same *Generous Inventors*; though indeed more *forward Foreigners* have endeavoured to *usurp* the *credit* of *both*. *This latter* likewise hath succeeded to considerable good effects, in some *new* Tryals that have been made of it in *Dantzick*, as appears in a Letter written from Dr. *Fabritius* of that City, and printed in the *Philosophical Transactions*.

Chap. III.

Another great Advantage of late Times, *from the Improvements of* Mathematicks; *particularly of* Arithmetick, Algebra, *and* Geometry, *discourst by Instances.*

I Proceed now to my *THIRD Instance* of *ARTS* (if the **Reverend Logician** will give me leave to use the word in this large sense) which are *Advantages* for *deep* search into Nature, and have been considerably advanc'd by the *Industry* and culture of *late* Times, above their *an-*

cient Stature. And the Inſtance was,

(III.) *THE MATHEMATICKS.* That theſe are mighty helps to *practical* and *uſeful Knowledge*, will be *eaſily* conſeſt by all, that have not ſo much *ignorance* as to render them *incapable* of information in theſe matters. And the Learned *Gerard Voſſius* hath proved it by *induction* in particulars. And yet it muſt be acknowledged that *Ariſtotle*, and the *diſputing Philoſophers* of his School, were not much addicted to thoſe *noble Inquiſitions*: For *Proclus* the *Commentator* upon *Euclide*, though he gives a very particular Catalogue of the *Elder Mathematicians*, yet hath not mentioned *Ariſtotle* in that number. And though *Diogenes Laertius* takes notice of a Book he inſcribed Μαθηματικὸν, another, Περὶ μονάδος, and a Third, yet extant, Περὶ ἀτόπων γραμμῶν; Yet it appears not that theſe were things of very great value; and *Ariſtotle*'s *Metaphyſical procedure*, even in *Phyſical Theories*, the *genius* and *humour* of his *Principles*, and the *aiery contentions* of his *Sect*, are huge preſumptions that *this Philoſopher* was not very *Mathematical*. And his numerous ſucceeding Followers, were certainly very little converſant in thoſe *generous* Studies. I have elſewhere taken notice, that there is more

more publish'd by those *Disputing men* on some paultry trifling Question about *ens Rationis*, and their *Materia prima*, than hath been written by their whole number upon all the *vast* and useful parts of *Mathematicks* and *Mechanicks*. There was a time when these were counted **Coniurations**; and I do not very well know the reason of the **Reverend Disputers** displeasure at my Discourse about *Dioptrick Tubes* (of which you will hear in the process) except he was under the dread of some such *phansie*, and believed there was **Magick** in *Opticks*. It would require much skill in those *Sciences*, to draw up the full *History* of their *Advancements*; I hear a very accurate *Mathematician* is upon it: And yet to fill up my Method, I'le adventure at some imperfect Suggestions about the *Inventions* and *Improvements* of this kind: And I begin,

(I.) With *ARITHMETICK*, which is the handmaid to all the other parts of Mathematicks. *This* indeed *Pythagoras* is said to have brought from the *Phœnicians* to the *Græcians*: but we hear no great matter of it till the days of *Euclide*: not the *Euclide* that was the *Contemporary* of *Plato*,

and Hearer of *Socrates*; but the famed *Mathematician* of that Name, who was after *Ariſtotle*, and at 90 years diſtance from the *former*. *This* is the *firſt* Perſon among the Ancients, that is recorded by the exact *Voſſius* to have done any thing accurately in that *Science*. After *him* it was *advanced* by *Diophantus*, *methodized* by *Pſellus*, *illuſtrated* among the *Latins* by *L. Apuleius*, and in later times much promoted by *Cardan*, *Gemma Friſius*, *Ramus*, *Clavius*, and divers more *modern* Artiſts, among whom I more eſpecially take notice of that Ingenious *Scot* the Lord *Napier*,

Who inverted the *Logarithmes*, which is a way of computing by *artificial* Numbers, and avoiding the *tædium* of *Multiplication* and *Diviſion*. For by this *Method* all thoſe Operations are performed by *Addition* and *Subſtraction*, which in *natural Numbers* were to be done thoſe *longer* ways. This *Invention* is of great uſe in *Aſtronomical Calculations*, and it may be applied alſo to other Accompts. Beſides *this*, the ſame Learned Lord found an eaſie, certain, and compendious way of Accounting by *Sticks*, called *Rabdology*; as alſo *Computation* by *Napier*'s *Bones*: Both theſe have

have been brought to greater perfection by others, since their *first Discovery*; particularly by *Ursinus* and *Kepler*.

To them I add the *Decimal Arithmetick*, which avoids the *tedious* way of *computing* by *Vulgar Fractions* in *ordinary* Accompts, and *Sexagenaries* in *Astronomy*; exceedingly and lately improved by our famous *Oughtred*, and Dr. *Wallis* a Member of the *ROYAL SOCIETY*. If I should here subjoyn the *Helps* this *Art* hath had from the Works and Endeavours of *Anatolius*, *Barlaam*, *Maximus Palanudes*, *Nemorarius*, *Florentinus Bredonus*, *Pisanus*, *Orentius*; and in *this Age*, from those of *Adrianus Romanus*, *Henischius*, *Cataldus*, *Malapartius*, *Keplerus*, *Briggius*, *Crugerus*, and a vast number reckon'd up by *Vossius*, I should be tedious on this Head; and therefore I pass lightly over it, and proceed,

(II.) To *ALGEBRA*, of *universal use* in all the *Mathematical Sciences*, in *Common Accompts*, in *Astronomy*, in *taking Distances* and *Altitudes*, in *measuring plain* and *solid* Bodies, and other *useful Operations*. The first noted Author in this Method was *Diophantus*, who lived long since the *Idol* of *Disputers*. He, and those other

Ancients that uſed it, performed their *Algebraical Operations* by *Signs* and *Characters* ſuted to the ſeveral *Numbers*, and *powers* of *Numbers*, which they had occaſion to uſe in *ſolving Problems*: But the later *Mathematicians* have found a far more neat and eaſie way, *viz.* by the *Letters* of the *Alphabet*, by which we can ſolve many *Problemes* that were too hard for the *Ancients*, as far as can be diſcovered by any of their remaining Works. For there were many *affected Æquations* (as they call them) that did not *equally aſcend* in the *Scale* of *Powers*, that could not be *ſolv'd* by the *elder Methods*; whereas the acute *Vieta*, a *Mathematician* of this laſt Age, affirms, he could *reſolve* any *Probleme* by his *own Improvements*. Beſides him, our excellent *Oughtred* another, lately mentioned, did much in this way. But the inimitable *Des Cartes* hath vaſtly out-done both former and later Times, and carried *Algebra* to that height, that ſome conſidering men think Humane Wit cannot advance it further. I will not ſay ſo much: but no doubt he hath performed in it things deſerving vaſt *acknowledgment*, of which you ſhall hear more anon. And from hence I ſtep, (III.) To

(III.) To the Conſideration of *GEOMETRY*, which is ſo *fundamentally uſeful* a *Science*, that without it we cannot in any good degree underſtand the *Artifice* of the *Omniſcient Architect* in the compoſure of the *great* World, and *our ſelves*. ΘΕΟΣ ΓΕΩΜΕΤΡΕΙ, was the excellent ſaying of *Plato*; and the *Univerſe* muſt be *known* by the *Art* whereby it was *made*. So that what *Galileo* notes of *Ariſtotle*, is a great ſign of his defects, *viz.* That he reprehended his Venerable Maſter for his *Geometrical Sublimities*, accuſing him that he receded from the *ſolid Methods* of *Philoſophizing*, through his too much indulging that Study; Which is ſo far from being likely, that *Geometry* is little leſs than abſolutely neceſſary to *ſolid* and *real Philoſophy*; and as I intimated, 'tis next to impoſſible to be a *judicious* and *accurate Philoſopher*, and want it. Upon which account, *Plato* admitted none to his School, but thoſe that were acquainted with that Science: Which practice the mentioned excellent *Modern*, notes to be directly oppoſite to the *Peripatetick* genius; and ſome he knew great men of that way, dehorted their Diſciples from *it*; which he introduceth

duceth one applauding as a *wiſe* Counſel, ſince *Geometry* would detect and ſhame the *futilities* of that *Notional way*. But not to take too large a compaſs, this is certain, That *Geometry* is a moſt *uſeful* and *proper help* in the affairs of *Philoſphy* and *Life*. 'Tis almoſt as clear from thoſe former intimations, that *Ariſtotle* was not much enclined *that way*; and we know that his *late Sectators*, have very ſeldome applied themſelves to *Geometrical Diſquiſitions*.

The Reſult of which is, We muſt expect the Advantages of this Science, from the declining of *his* and *their Empire*; and I need not ſay *expect* it, they are both in preſent view. And if after this you require accounts of the *Improvements Geometry* hath received, ſince the foundation of that *Tyranny* by the *Man* of *STAGYRA*, I ſhall offer you the beſt I have; and though I am conſcious that they will be *ſcant* and *defective*, yet I hope *ſufficient* for my preſent purpoſe.

I note then from the celebrated *Voſſius*, That *Euclide* was the *firſt* that brought *Geometry* into a *Method*, and more *accurately demonſtrated* thoſe Principles, which before were ſcattered among the *Greeks* and *Ægyptians*, and not ſo *cogently* or *carefully* proved.

proved. And *Proclus* reckons this *Famous man* as the *Compiler* and *Demonſtrator*, not as the *Inventor* of the *Elements*; and two of theſe Books (*viz.* 14. & 15.) are aſcribed to *Apollonius Pergæus*, who was his *neareſt Succeſſor* in *Fame* for *Mathematical* Abilities. *This Geometrician* improved the *Science* by four Books of *Conicks*, publiſh'd of old; and three more have been lately (in the year 1661.) tranſlated out of an *Arabick Manuſcript* in the Duke of *Tuſcany's Library*, and are now abroad. This *Manuſcript Jacob Golius* procured out of the *Eaſt*. Beſides which, *this Magnus Geometra*, as he was called, *illuſtrated Euclide* by his Learned *Commentary* upon him. But *Archimedes* of *Syracuſe*, was a Perſon of the greateſt renown for *Geometrical* and *Mechanical Performances*; concerning which, *Polybius*, *Valerius*, *Plutarch*, *Livy*, and others, have recorded *prodigious* things. This great *Wit* carried *Geometry* from *general* and *idle Speculation*, to the *uſe* and *benefit* of Mankind; whereas before him it was an *ancient* and *perverſe Opinion*, That *this Knowledge* ought not to be brought down to *vulgar Service*, but kept up in *abſtractive Contemplations*: upon which ſcore *Archytas* and *Eudoxus*, thoſe great *Geometricians* before

before *Euclide*, were ſcared from the *Mechanical* and *Organical Methods*, to the great hindrance of *beneficial Improvements* in *that way*. But the excellent *Syracuſian* underſtood, that *this Science* is not *debaſed*, but *promoted* and *advanced* by ſuch *Accommodations*; and evinc'd the *uſefulneſs* and *excellency* of *Geometry*, in his admirable *Paradox* propoſed before King *Hieron* (*Datis viribus datum pondus tollere*) [Δὸς μοὶ πᾶ στῶ καὶ κινάσω τὰν γᾶν] *This Mathematician* flouriſh'd 160 years after the time of *Ariſtotle*, who hath the name of the moſt ancient that writ in *Mechanicks*, though that Book of his be not mentioned either by *Archimedes*, *Athenæus*, *Hero*, or *Pappus*, *Mechanical* Authors; and *Cardan* and *Patricius* affirm *that Work* to be none of *Ariſtotle*'s: Whoſe ever it was, the *Performance* hath praiſe from the *Learned*, as explaining the *general Cauſes* of *Mechanical Geometry*. But *Archimedes* was more *practical* and *particular*: And though *Plutarch* in the Life of *Marcellus* affirms he writ nothing; yet the contrary is abundantly proved by *Gerard Voſſius*, who hath ſhewn that the Books extant under his Name, that contain ſo many great *Maxims* of *Mechanicks*, are *genuine*; and both *Strabo* and *Pappus* mention

tion them as *his*. The Design of *Archimedes*, of combining *Mechanism* and *Geometrick Theory*, was after happily promoted by *Hero* the Elder of *Alexandria*, who *invented* those *ingenuous Automata*, that move by *Air* and *Wyres*; concerning which he writ a Book that was Translated by *Fredericus Commandinus*, as also he did another *De Machinis Bellicis*, by which he well improved *Geometrick Mechanicks*: And *Pappus* particularly celebrates his exactness in solving the *Deliaick Problem*, *De Cubo duplicando*, acknowledging that he took most of his own Accounts about that matter, from *that exquisite Man*. Next him, I mention *Theodosius* of *Tripoli*, who very much improved *Geometry* by his three Books *De Figura Sphærica*, which afforded great assistance to *Ptolomy*, *Pappus*, *Proclus*, and *Theon*, in their *Mathematical Endeavours*. *Menelaus* also, who lived in *Trajan*'s time, contributed very much to the *perfecting* the Doctrine of *Sphæricks*, as *Vitellio* well knew, who was famous for those things which he borrowed from that Author. The Performances also of *Ctesibius*, who lived in the time of *Ptolomæus Physcon*, are much celebrated by *Pliny*. He invented many things in *Hydraulicks*, and according to *Athenæus*,

Athenæus, he was the first *Contriver* of *Musical Organs*. These were *Mechanical*: but *Geminus Rhodius* the Master of *Proclus Lycius*, applied *Logick* to *Geometry*, out of *particular Elements* abstracting *Universals*. He demonstrated, That there are only *Three similar Species* of all *Lines*, viz. *Right*, *Circular*, and *Cylindrical*: And *Perseus* following his steps, enrich'd *Geometry* with the Invention of *three kinds* of *Crooked Lines*, the *Parabole*, *Hyperbole*, and *Elipsis*; for which he expres's'd his extatick joy, as *Thales*, *Pythagoras*, and *Archimedes* did upon like occasions, in a *Sacrifice* to the *Gods*. But to be briefer, *Pappus* improved the *Sphæricks*; *Theon* more *methodically* digested the *Elements* of *Euclide*; *Serenus Antinsensis* discover'd, that the *Section* of a *right Cylindre*, is the same with the *Elipsis* of a *right Cone*; *Copernicus* improved the *Doctrine* of *Triangles*; *Ramus corrected* and *supplied Euclide*, where his *Principles* were *defective*; *Maurolicus* writ *first* of *Secant Lines*; *Clavius* much illustrated and promoted the *Doctrine* of *Tangents*, *Secants*, *Triangles*, *Right Lines*, and *Sphæricks*, besides what he did in his *Comment* upon *Euclide*. I might mention with These, the worthy Performances of *Cusanus*, *Pitiscus*, *Snellius*,

Snellius, *Ambrosius Rhodius*, *Kepler*, *Franciscus à Schoten*, and others, who contributed very eminently to the perfections and advancements of *Geometry*, and were late men. But none have done in it like the excellent Persons whom I reserve for my last mention; The chief are *Vieta*, *Des Cartes*, and Dr. *Wallis*.

Chap. IV.

Improvements *in* Geometry *by* Des Cartes, Vieta, *and* Dr. Wallis.

IN order to my giving an account of some of their Performances, I must premise, That no great things can be done in *Geometry*, without the *Analytical Method*; And though some Learned Men conceive the *Ancients* were acquainted with *this* way of *resolving Problems*, yet their skill in it went no higher than the *Quadratick* Order of *Æquations*, which They *demonstrated* by *Circles* and *Right Lines*, which They call'd *Loca plana*: but they were able to do nothing in the *Cubical Æquations*, or any of the

the *Superiour Orders*; though they endeavour'd to cover their *defects* in this *Art*, by recourſe *ad Locos Solidos*, (viz. *Conick Sections*) and *Lineares*, as they called them, ſuch as the *Helix*, *Conchoeides*, and thoſe of like nature. But thoſe *tortous* and *curved* Lines being deſcribed *Mechanically* by *Compound Motions*, the *Problems reſolv'd* by them are performed *Organically* by the *hand* and *eye*, not *Geometrically*.

This was the State of the *Analytick Art*, as long as Learning flouriſh'd in *Greece*; when *That* was ſubdued by the *Barbarians*, their Learning with their Country paſſed to the *Arabians*, and alſo to the *Perſians*, as we have it from *Hottinger* and *Bullialdus*: But theſe *Succeſſors* of the *Greeks* did not *advance* their Learning beyond the *imperfect Stature* in which it was delivered to them. In that condition it remained till *Cardan* and *Tartaglia*, who made ſome ſmall addition towards the *perfection* of it; For they gave ſome Rules for ſolving *Cubical Æquations*, which were certain in ſome caſes, but not in all. Their *Invention* ſome other *Mathematical* men endeavoured to *advance*, laying down *Rules* for ſolving ſome *Cubick* and *Biquadratick Æquations*; but could never find an *univerſal* way, that might

might reach all such: Yea indeed they *utterly despaired*, and held it *impossible*. At length appears *Vieta*, who by inventing the *Method* of *Extracting Roots* in the most *numerous Æquations*, and by converting the *Signs* used by the *Ancients* into *Letters*, brought *Algebra* to a very great *perfection*, as I have noted above; and by enriching the *Analytical Art*, by the *Accessions* of his *Exegetice Numerosa*, and *Logistice Speciosa*, he hath contributed infinite helps to *Geometry*. After him, divers other Learned men polisht and adorned his Discourses; among whom I mention chiefly our Countrymen *Harriot* and *Oughtred*, who altred *Vieta*'s *Notes* to advantage, and invented *Canons* to direct our *Operations* in the *Extracting* of *Roots*, both in *pure* and *adfected Æquations*.

But after these had thus improved the *Analytick Art*, and well assisted *Geometry* by it, *Des Cartes* appears, one of the greatest *Wits* that ever the Sun saw, a Person too *great* for praise, designed by *Heaven* for the *Instruction* of the Learned World, and who no doubt will be the Object of its *admiration*, as long as there is any *Learning* in it. This wonderful man

in a *few Pages*, opens a way to *mighty Performances:* He ſhews us how all the *Problems* of *Geometry* may be brought to ſuch terms, that we ſhall need nothing to the *Conſtruction* and *Demonſtration* of them, but the knowledge of the *length* of certain *right Lines*; and that, as all the Operations of *Arithmetick* are performed by *Addition*, *Subſtraction*, *Multiplication*, *Diviſion*, and *Extraction* of *Roots* (which is a *ſpecies* of *Diviſion*). So in *Geometry*, for the preparation of *Lines* that they may be *known*, nothing needs more to be done, than that others be *added* to them, or *ſubſtracted* from them; or if the *Line* be *ſingle* (which that it may be the better referred to Numbers, may be called *Unity*) and beſide *that*, two other Lines, that a *Fourth* be found which ſhall have the ſame *proportion* to *one* of *theſe Lines*, that the other hath to *Unity*, which is the ſame with *Multiplication*; or elſe, that by them a *Fourth* be found, which may have the ſame *proportion* to one of them, which *Unity* hath to the other, which is the ſame with *Diviſion*; or laſtly, That there be found between *Unity*, and ſome other *Right Line*, two or more *mean Proportionals*, which is the ſame thing with the *Extraction* of *Quadratick* and *Cubick Roots.*

Roots. And that he may justifie the introducing of *Terms Arithmetical* into *Geometry*, he observes, That the avoiding thereof was an occasion of much *perplexity* and *obscurity* in the *Geometry* of the *Ancients*; of which he could give no other conjecture, but because they did not sufficiently understand the *affinity* and *cognation* of those Sciences. But if I should intend an *exact History* of all his Performances, I must *transcribe Him*; for he hath said so much in little, that 'tis impossible to abridge those his *close Compositures*. I shall therefore only hint some principal things, referring you to his Writings for the rest.

And I take notice *first*, That he hath proposed an *Universal Method* for the *Solution* of all *Problems*; not only those propounded in *Right Lines*, *Plains*, and *Solids*: but also all that are made in *Angles*, a thing of most general Service in all parts of *Mathematicks*. By It he resolves the *famous Proposition* in *Pappus*, which was too hard for *Euclide*, *Apollonius*, and all the *Ancients*. He discourses the nature of *crooked* Lines, and shews which are fit to be used in *Geometrical Demonstrations*; Gives *Rules* for the place where to apply our selves in the *Demonstration* of any *Problem*;

blem; and tells us, that a *Problem* after it is brought to an *Æquation*, and reduced to its *leaſt* terms, and the *unknown Quantity* is *Quadratick*, or of two dimenſions, that then it may be demonſtrated by a *Right Line* and *Circles*: but if the *Æquation*, after it is reduced to its *leaſt Terms*, leave the unknown *Quantity*, *Cubick* or *Biquadratick*, it muſt be demonſtrated by ſome one of the *Conick Sections*. Whereas again, if after the *Æquation* reduced, the unknown Quantity remain of five or ſix *Dimenſions*, or more, *in infinitum*, then the Demonſtration muſt be performed by *Lines* more and more *compound*, according to the *degree* of *Compoſition* in the *unknown Quantity* of the *Æquation*. But becauſe the way by *Lines* is *perplext* and *tedious*, he gives *Rules* to reduce *Æquations* of *many Dimenſions*, to *fewer*. He ſhews how to *fill* up *defects*, when any *Terms* are wanting in the *Æquation*; how to convert the *falſe Roots* into *true*, to avoid *Fractions*, and to *leſſen Æquations*. He hath *demonſtrated* by a *Circle* and *Parabole* the famous *Problems* ſo much agitated among the *Ancients*, *viz.* the *Triſection* of an *Angle*, and the *finding two mean Proportionals between two Lines given*, with more brevity and expe-

dition

dition than any that went before him. And this, Sir, shall suffice by way of intimation, concerning that Prince of Mathematicians and Philosophers.

Since *him*, others have improved his *Method*. *Schotenius* hath demonstrated the *Loca Plana* of *Apollonius*: *Hadderius* hath added Inventions of *use* and *pleasant speculation* in his *Tract* of *Reduction* of *Æquations*. *Florimundus de Beaune* hath writ ingenious and profitable things *de Natura & Limitibus Æquationum*. But 'twould be endless to attempt full Accounts of the Modern Advancements of this Science, or indeed those accessions of growth it hath had since *Vieta*. And whoever should go about it, must reckon to begin anew as soon as he hath finish'd what he intended, since *Geometry* is *improving daily*.

I shall therefore add no more here, but only do right to an excellent Person of our own Nation, Dr. *John Wallis*, a Member of the *ROYAL SOCIETY*, to whom *Geometry* is exceedingly indebted for his rare Discoveries in that *Science*. Particularly, he hath propounded a Method for the *measuring* of all kind of *crooked Lines*, which is highly ingenious; and put an end

to all future Attempts about *Squaring* the *Circle*, which hath *puzzled* and *befooled* ſo many *Mathematicians*, that have ſpent their *thoughts* and *time* about it. This he hath brought to effect as neer as it can be done, and ſhew'd the *exact* performance by *rational Numbers* impoſſible; He hath propoſed excellent ways for the *meaſuring* all kinds of *Plains*, and all *multangular* and *ſolid Bodies*. But 'tis time now to proceed to the conſideration of the next *Mathematical Science*, viz.

Chap. V.

The late Improvements *of* Aſtronomy.

(4.) ASTRONOMY, one of the *grandeſt* and moſt *magnifique* of all thoſe that lie within the compaſs of *Natural Inquiry*. I ſhall not look back to its beginning among the *Chaldæans*, *Ægyptians*, and *eldeſt Græcians*, in which Times it was but *rude* and *imperfect*, in compariſon to its *modern Advancements*. For the great Men among the *Greeks* are taken much notice of, but

but for very *ordinary* and *trite* things in this Science: As *Anaximander Milesius*, for teaching, *That the Earth was Globous, and the Centre of the World not bigger than the Sun*: *Anaximines* for affirming, *That the Moon shone but with a borrowed Light*; *That the Sun and It were Eclips'd by the Earths interposal*; and, *That the Stars move round our Globe*. And *Pythagoras* was the *first* that noted the *obliquity* of the *Ecliptick*. *This Philosopher* indeed was a Person of a *vast* reach, and said things in *Astronomy* very agreeable to *late Discoveries*: But the **Disputers** *Omniscient Aristotle* made very *odd Schemes*, not at all corresponding with the *Phænomena* of the *Heavens*, as appears from his *Hypotheses* of **Solid Orbs, Epicycles, Excentricks, Intelligences,** and such other ill-contrived Phancies. Besides which, if I should descend to consider his now palpable Mistakes about the nature of *Comets*, the *Galaxy*, the *Sphere of Fire* under the *Moon*, and numerous other such, I should oblige my self to a large ramble. Wherefore to be as close as may be in these Notes, I observe, That after *Aristotle*, *Astronomy* was cultivated and improved by *Theophrastus*, *Aratus*, *Aristarchus Samius*, *Archimedes*, *Geminus*, *Menelaus*,

nelaus, *Theon*, *Hipparchus*, *Claudius Ptolomæus*, and infinite others among the *Greeks*,

Among *later* Authors, conſiderable things have been done in this way by both *Latins* and *Arabians*: To omit the *latter*, I ſhall give you ſome *particular Inſtances* of the other.

Johannes de Sacro Boſco ingeniouſly and *methodically* explained the *Doctrine* of the *Sphere*. *Thebit firſt* found the *Motion* of *Trepidation*. *Regiomontanus* publiſhed the *firſt Ephemerides*, and did excellent things in his *Theoricks* of the *Planets*. *Wernerus* ſtated the greateſt *Declination* of the *Sun*. *Albertus Pighius* directed the way to find *Æquinoxes* and *Solſtices*. *Baerſius* framed *perpetual Tables* of the *Longitudes* and *Latitudes* of the *Planets*. *Copernicus* reſtored the *Hypotheſis* of *Pythagoras* and *Philolaus*, and gave far more *neat* and *conſiſtent Accounts* of the *Phænomena*. *Joachimus* made *Ephemerides* according to the *Copernican* Doctrine. *Clavius* invented a moſt uſeful *demonſtrative Aſtrolabe*, and writ an *exquiſite Comment* upon *Sacro Boſco*.

(But) I conclude the laſt Century with the Noble *Tycho Brahe*, who performed the glorious Work of reſtoring the *Fix'd Stars* to their *true* places, the *aſſignation* of which before

before him, was rather by *gueſs*, than any *competent Rules*; and the *miſtakes* here, were the very root and foundation of moſt *Errors* in *Aſtronomy*. For which reaſon it was, that *Copernicus* left that *earneſt advice* to his Scholar *Joachimus*, that he ſhould apply himſelf to the *reſtitution* of the *Fix'd Stars*; for till this were done, there could be no hopes of attaining to the *true places* of the *Planets*, nor doing any thing to purpoſe in the whole *Science*. This ingaged the Noble *Tycho* to this Enterpriſe, and he made it the Foundation of all the reſt. The Method he uſed is deſcribed by *Gaſſendus*. By the help of this noble Performance he reformed the elder *Aſtronomical Tables*, both the *Ptolomaick* and *Copernican*. And from his Obſervations of the new Star of 1572, and ſix others in his time, he aſſerted *Comets* into their place among *Heavenly Bodies*, ſhattering all the *Solid Orbs* to pieces; And he hath done it with ſuch *clear conviction*, that even the *Jeſuits*, whoſe thraldom to the *Church* of *Rome*, deters them from cloſing with the *Motion* of *Earth*, confeſs a neceſſity of repairing to ſome other *Hypotheſis* than that of *Ptolomy* and *Ariſtotle*. I might add to this, That this *generous* Nobleman invented

ed and framed such excellent *Astronomical Instruments*, as were by vast odds for *use* and *convenience* far beyond *any* of former times: Himself hath a Treatise concerning them. He hath also made exquisite *Tables* of the difference that *Refractions* make in the *appearance* of the *Stars*, and done more great things for *Astronomical Improvement*, than many *Ages* that were before him; for which reason I could not pardon my self in a curt mention of so glorious an Advancer of this Science.

The next Age after him, which is *ours*, hath made excellent *use* of his *Discoveries*, and those of his *Elder*, the famed *Copernicus*; and raised *Astronomy* to the noblest *height* and *perfection* that ever yet it had among men. It would take up a Volume to describe, as one ought, all the particular *Discoveries*: But my Design will permit but a short mention. Therefore briefly, I begin with *Galilæo*, the reputed Author of the famous *Telescope*; but indeed the glory of the *first Invention* of that excellent *Tube*, belongs to *Jacobus Metius* of *Amsterdam*: but 'twas improved by the noble *Galilæo*, and he first applied it to the *Stars*; by which *incomparable* Advantage, he discovered the *Nature* of the *Galaxy*, the 21 *New*

Stars

stars that compose the *Nebuloſa* in the head of *Orion*, the 36 that conſpire to *that* other in *Cancer*, the *Anſulæ Saturni*, the *Aſſeclæ* of *Jupiter*, of whoſe *Motions* he compoſed an *Ephemeris*. By theſe *Lunulæ* 'tis thought that *Jupiters diſtance* from the *Earth* may be determined, as alſo the diſtance of *Meridians*, which would be a thing of vaſt uſe, ſince this hath always been meaſured by *Lunar Eclipſes*, that happen but once or twice a year; whereas opportunities of Calculating by the *occultations* of theſe *new Planets* will be *frequent*, they recurring about 480 times in the year. Beſides, to haſten off, *Galilæo* diſcovered the ſtrange *Phaſes* of *Saturne*, on while *oblong*, and then *round*; the *increment* and *decrement* of *Venus*, like the *Moon*; the *Spots* in the *Sun*, and its *Revolution* upon its own *Axis*; the *Moons libration*, collected from the various *poſition* of its *Maculæ*; and divers other wonderful and uſeful Rarities, that were ſtrangers to all *Antiquity*. Shortly after *Galilæo*, appears *Chriſtopherus Scheiner*, who by greater *Teleſcopes* viewed the *Sun* with a *curled* and *unequal Superficies*, and in or near the *Horizon* of an *Elliptical figure*. He found alſo, That *that ſuppoſed uniform* Globe of Light, was of a *different*

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complexion in its ſeveral parts; ſome *brighter* than the main Body, as the *Faculæ*; others *darker*, as the *Maculæ*. He made more than 2000 *Obſervations* of them, and deſcribed their *Number*, *Magnitude*, *Situation*, *Figure*, and *Revolutions*. But I muſt contract. *Kepler* is next, who firſt propoſed the *Elliptical Hypotheſis*, made very *accurate* and *luciferous Obſervations* about the *Motions* of *Mars*, and writ an *Epitome* of the *Copernican Aſtronomy*, in the cleareſt and moſt perſpicuous Method, containing the Diſcoveries of others, and divers conſiderable ones of his own; not to mention his *Ephemerides*, and Book about Comets. *Ant. Maria Shirlæus*, with a new *Teleſcope* of a larger *diameter* than ordinary, diſcovered five other *Stars* more remote from *Jupiter* than his *Satellites*, and a kind of *vapid Atmoſphere* about that *Planet*. *Franciſcus Fontana* obſerved the ſame *Star*, with nine others never leaving it more than ten of its *diameters*; and in 1636. and 1643. with 8. *Anno* 1645. with 5, 1646. with 7. on other days with 6. varying their diſtances one to another, and not to be ſeen about *Mars* nor *Saturn*, nor without extending the *Teleſcope* more than was fitting for *Fix'd Stars*. Theſe *Satellites* are obſerved to ſuffer

ſer a *defection* of their Light, when *Jupiter* interpoſeth between *them* and the *Sun*; whence it is inferr'd, That they have their Light from *It*, and that *Jupiter* hath *none* of his *own* to impart to them. But to paſs on lightly, *Longomontanus* deſcribed the World according to all the *Hypotheſes* of *Ptolomy*, *Copernicus*, and *Ticho Brahe*. *Janſonius Blaeu* made far more perfect and exact *Celeſtial Globes* than any were extant before. *Gaſſendus* writ judiciouſly of the *Stars* about *Jupiter*, and of *Mercury* in the *Sun*, and gave the World moſt excellent *Aſtronomical Inſtitutions*. *Iſmael Bullialdus* inrich'd the Science with a new Method to find and eaſily compute the *Paralaxes* of *Solar Ellipſes*. *Hevelius* drew a *Graphical Deſcription* of the *Moon* in all its *Phaſes*, as it appear'd in the *Teleſcope*, accurately delineating its *Spots*, and ſhewing the *inequality* and *mountanous protuberances* of its ſurface, which lends light to a vaſt *Theory*. Both theſe laſt named are Fellows of the *ROYAL SOCIETY*. Of the *Selenography* of *Hevelius*, *Ricciolus* made an *Improvement*, both as to the *Number*, *Figure*, *Magnitude*, *Site*, *Colour* of the *Maculæ*, and the *Eminencies*, *Profundities*, and *Aſperities* of the *Lunar Superficies*. *Martinus Hortenſius* found

found *Mercury* to have variety of *Phases*, like the *Moon*; as, now *Horned*, then *Gibbous*, and at other times *Round*. But I conclude this Account with the most Worthy and Learned Prelate **Dr. *Seth Ward***, now Lord Bishop of *Sarum*, who among his other excellent Performances in *Astronomy*, hath *demonstratively* proved the *Elliptical Hypothesis*, which is the most *plain* and *simple*, and performed by fewer Operations than either of the other. This indeed was *first* discours'd of by *Kepler*, advanced by *Bullialdus*, but *demonstrated* by this *accomplish'd* and *Venerable* Bishop, an Honourable Member of the *ROYAL SOCIETY*.

Chap. VI.

Improvements of Opticks and Geography.

I Come next (5.) To consider the *OPTICKS*, whose *Improvements* are of great importance in the matters of *general Philosophy* and *humane* Life; since the *informations*

nformations of *Senſe* are the ground of *both*, and *this Science rectifies* and helps the nobleſt of them. Concerning it, there was once a Book of *Ariſtotle*'s extant, according to *Laertius*: but it hath ſubmitted to *Time*. Since him, this Science hath been cultivated by *Euclide*, and the celebrated *Archimedes*, who is ſaid to have done ſtrange things by it, upon the Ships of *Marcellus*: As *Proclus*, who improved the *Archimedean Artifices*, deſtroyed a Fleet by his *Specula Uſtoria*, that beſieged *Conſtantinople*. *Ptolomy* of *Alexandria* made conſiderable *Improvements* of *Opticks*; and *Alhazenus* the *Arabian*, is famous for what he did in It. From *theſe*, *Vitellio* drew *his*, and advanced the *Science* by his *own* Wit, and *their* Helps. *Stevinus* corrected *Euclide*, *Achazen*, and *Vitellio*, in ſome *fundamental Propoſitions* that were miſtakes; and in their room ſubſtituted conſiderable Inventions of his own. *Roger Bacon* our fam'd Countryman, whom *Picus Mirandula* calls the *Phœnix* of his Age, and *Voſſius*, one *Learned* to a *miracle*, writ acutely of *Opticks*. He was accuſed of *Magick* to *Pope Clement* iv. and thereupon impriſoned: But the Accuſation was founded on nothing but his skill in *Mathematicks*, and

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the *ignorance* of his *Accuſers*. After *theſe*, the *Dioptricks* were improved by *Kepler*, *Gaſſendus*, *Merſennus*, and the noble and incomparable *Des Cartes*, who hath ſaid the moſt *clear*, *uſeful*, and *improvable* things about it, that ever were extant on the Subject. But nothing hath ſo much advanc'd the Science, as the invention of the *Teleſcope* by *Metius*; and *that* other of the *Microſcope*, concerning which I have to ſay in the following Inſtances. I paſs therefore to the *laſt* I ſhall mention in the *Mathematicks*, which is,

(VI.) *GEOGRAPHY*. In *this* the *Ancients* were exceedingly *defective*. And *Ariſtotle knew* the *World*, by the ſame *figure* his *Scholar conquer'd* it. 'Tis noted by the ingenious *Varenius*, that the moſt *general* and *neceſſary* things in *this Science* were then *unknown*; as, The *Habitableneſs* of the *torrid Zone*; The *flux* and *reflux* of the *Sea*; The *diverſity* of *Winds*; The *Polar propertie* of the *Magnet*; The *true dimenſion* of the *Earth*. They wanted *Deſcriptions* of remote *Countries*, concerning which both the *Greeks* and *Romans* had very *fabulous Relations*. They knew not that the *Earth* was *encompaſſed* by the *Sea*, and might

might be *Sailed round*. They were totally ignorant of *America*, and both the *North* and *South* parts of this *Hemisphere*; yea, and understood very little of the *remoter* places of their own *Asia*. *Japan*, the *Java's*, the *Philippicks*, and *Borneo*, were either not at all *known*, or exceeding *imperfectly* of *old*: But all *these* are *familiar* to the *latter Times*. *Mexico* and *Peru*, and the *vast Regions* of those *mighty Empires*, with the many *Isles* of the *Great Sea* are discloſed. The *frozen North*, the *torrid Line*, and formerly *unknown South*, are *visited*, and by their numerous *Inhabitants* found not to be so *inhospitable* and *unkind* to men, as *Antiquity* believed. The *Earth* hath been *rounded* by *Magellan*, *Drake*, and *Candish*. The *great Motion* of the *Sea* is *vulgar*, and its *varieties* inquiring every day: The *diversities* of *Winds stated*, and better understood: The *Treasure* of *hidden* Vertues in the *Loadstone*, found and used. The *Spicy Islands* of the *East*, as also *those* of the *remote South* and *North*, *frequented*, and the knowledge of that *People* and those *Countries* transmitted to us, with their *Riches*; The most distant being Parts Travell'd and Describ'd. Our *Navigation* is far *greater*, our *Commerce* is more *general*,

our *Charts* more *exact*, our *Globes* more *accurate*, our *Travels* more *remote*, our *Reports* more *intelligent* and *ſincere*; and conſequently, our *Geography* far more *perfect*, than it was in the *elder Times* of *Polybius* and *Poſſidonius*, yea than in thoſe of *Ptolomy*, *Strabo*, and *Pomponius Mela*, who lived among the *Cæſars*. And if It was ſo *ſhort* in the *flouriſhing* Times of the *Roman Empire*, how was it *before*, in the days of *Ariſtotle* and the *Græcians*? We have an Inſtance of it in the *Great Macedonian*, who thought the *bounds* of his *Conqueſts* to be the *end* of the *World*; when there were *Nations* enough beyond them, to have *eaten* up the *Conqueror*, with his *proud* and *triumphant* Armies. So that here alſo *Modern Improvements* have been *great*; and you will think ſo, if you compare the *Geographical Performances* of *Gemma Friſius*, *Mercator*, *Ortelius*, *Stevinus*, *Bertius*, and *Guil. Blaeu*, with the beſt Remains of the moſt celebrated *Geographers* of the more *ancient* Ages.

CHAP. VII.

That Useful Knowledge *is to be aided by* Instruments. *Modern Instances of such. Of the* Telescope, Microscope, *and* Thermometer.

THus, Sir, I have touched upon some of the *Improvements* of the *ARTS* that search into the *recesses* and *intrigues* of *Nature*, with which *latter Ages* have assisted *Philosophical* Inquiries. And in *these* I see I have struck farther than I was aware, into the account of those things also which lead us to the *grosser Phænomena*; and my Remarques about *Geography* are all of that nature. However I shall not alter my Method; but after I have discours'd the *INSTRUMENTS* I mentioned for Useful Knowledge, I shall consider somewhat of *NATURAL HISTORY*, which reports the *Appearances*, and is *fundamentally necessary* to all the Designs of *Science*. As for the *INSTRUMENTS* then, that are next, before I come to give you

the Notes I intend concerning them, I obſerve, That

The *Philoſophy* that muſt ſignifie either for *Light* or *Uſe*, muſt not be the *work* of the *Mind* turned in upon *it ſelf*, and only converſing with its own *Idæas*; but *It* muſt be raiſed from the *Obſervations* and *Applications* of *Senſe*, and take its Accounts from Things as they are in the *ſenſible world*. The Illuſtrious Lord *Bacon* hath noted this as the chief cauſe of the unprofitableneſs of the *former Methods* of *Knowledge*, *viz.* That *they* were but the *Exerciſes* of the *Mind*, making *Concluſions*, and ſpinning out Notions from its own *native ſtore*; from which way of proceeding, nothing but *Diſpute* and Air could be expected. 'Twas the fault that Great Man found in the Ancients, That they flew preſently to *general Propoſitions*, without ſtaying for a *due information* from Particulars, and ſo *gradually* advancing to *Axioms*: Whereas the *Knowledge* from which any thing is to be hoped, muſt be laid in *Senſe*, and raiſed not only from ſome few of its *ordinary* Informations; but *Inſtances* muſt be *aggregated*, *compared*, and critically *inſpected*, and *examined ſingly* and in *conſort*. In order to which Performances, our *Senſes* muſt

muſt be *aided*; for of themſelves they are too narrow for the *vaſtneſs* of things, and too *ſhort* for *deep Reſearches*: They make us very *defective* and *unaccurate Reports*, and many times very *deceitful* and *fallacious ones*. I ſay therefore, *they* muſt be aſſiſted with *Inſtruments* that may *ſtrengthen* and *rectifie* their Operations. And in *theſe* we have mighty *advantages* over *Ariſtotle* and the *Ancients*; ſo that much greater things may well be expected from *our Philoſophy*, than could ever have been performed by *theirs*, though we ſhould grant them all the *ſuperiority* of *Wit* and *Underſtanding* their fondeſt Admirers would aſcribe to thoſe *Sages*. For a *weak hand* can move more *weight* by the help of *Springs*, *Wheels*, *Leavers*, and other *Mechanick Powers*, than the *ſtrongeſt* could do without them. And that we really have theſe *Advantages*, muſt be ſhewn by *Inſtance*: I mentioned *Five* that are conſiderable to that purpoſe, which I took notice of among many others; and they were the *TELESCOPE*, *MICROSCOPE*, *THERMOMETER*, *BAROMETER*, and *AIR-PUMP*.

(I.) The *TELESCOPE* is the moſt excellent *Invention* that ever was, for aſſiſting the *Eye* in *remote Diſcoveries*. The *di-*

ſtance of the Heavens is ſo *vaſt*, that our *unaided Senſes* can give us but extreamly imperfect Informations of that Upper World; And the *Speculations* that *Antiquity* hath raiſed upon them, have for the moſt part been very *mean*, and very *falſe*: But theſe excellent *Glaſſes* bring the *Stars* nearer to us, and acquaint us better with the *immenſe Territories* of *Light*: They give us more *Phænomena*, and *truer Accounts*; diſperſe the *ſhadows* and *vain Images* of the *twilight* of *naked ſenſe*, and make us a *clearer* and *larger proſpect*. By theſe Advantages *they inlarge* our *Thoughts*, and ſhew us a more *magnificent Repreſentation* of the *Univerſe*: So that by them the *Heavens* are made more *amply* to *declare* the *Glory* of *God*, and we are help'd to *nobler* and better-grounded *Theories*. I have mentioned in my Account of the Advance of *Aſtronomy*, ſome of the moſt remarkable *Diſcoveries* that have been made by *theſe Tubes*, which exceedingly tranſcend all the *Imaginations* of *Elder* Times; and by the further improvement of them, other things may be diſcloſed as much beyond all *ours*. And the *preſent Philoſophers* are ſo far from deſiring that Poſterity ſhould ſit down contented with their *Diſcoveries* and *Hypotheſes*,

ſes, that they are continually ſollicitous for the gaining more *helps* to themſelves, and *thoſe* that ſhall follow, for a further progreſs into the knowledge of the *Phænomena*, and more *certain judgments* upon them. So that theſe *Glaſſes* are exceedingly *bettered* ſince their Invention by *Metius*, and *application* to the *Heavens* by *Galilæo*; and ſeveral ingenious Members of the *ROYAL SOCIETY* are now buſie about improving them to a greater height. What ſucceſs and informations we may expect from the *Advancements* of this *Inſtrument*, it would perhaps appear *Romantick* and *ridiculous* to ſay; As, no doubt, to have talk'd of the *ſpots* in the *Sun*, and *vaſt inequalities* in the *ſurface* of the *Moon*, and thoſe other *Teleſcopical certainties*, before the *Invention* of that *Glaſs*, would have been thought *phantaſtick* and *abſurd*. I dare not therefore mention our *greateſt hopes*: but this I adventure, That 'tis not unlikely but *Poſterity* may by thoſe *Tubes*, when they are brought to *higher degrees* of *perfection*, find a *ſure* way to determine thoſe *mighty Queſtions*, *Whether the Earth move*? or, *the Planets are inhabited*? And who knoweth which way the *Concluſions* may fall?) And 'tis probable enough,

that another thing will at laſt be found out, in which this lower World is more immediately concerned, by *Teleſcopical Obſervations*, which is, the moſt deſired *Invention* of *Longitudes*; upon which muſt needs enſue yet greater Improvements of *Navigation*, and perhaps the Diſcovery of the *North-weſt* Paſſage, and the yet *unknown South*. Whatever may be thought of theſe Expectations by Vulgar and *narrow* Minds, whoſe *Theories* and *Hopes* are confin'd by their *Senſes*, thoſe that conſider, that *one Experiment* diſcovered to us the vaſt *America*, will not *deſpair*. But 'tis time to paſs from *this*, to a *ſecond Modern Aid*, whereby our *Sight* is aſſiſted, which is,

(II.) The *MICROSCOPE*. The *Secrets* of Nature are not in the *greater Maſſes*, but in thoſe *little Threds* and *Springs* which are too *ſubtile* for the *groſneſs* of our *unhelp'd Senſes*; and by *this Inſtrument* our eyes are aſſiſted to look into the *minutes* and *ſubtilties* of things, to diſcern the otherwiſe *inviſible Schematiſms* and *Structures* of *Bodies*, and have an advantage for the finding out of *Original Motions*; To perceive the *exactneſs* and *curioſity* of *Nature* in all its *Compoſures*; And from *thence* take *ſenſible Evidence* of the

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Art and *Wiſdom* that is in its Contrivance; To diſcloſe the *variety* of *living Creatures* that are ſhut up from our *bare Senſes*, and open a kind of other World unto us, which its *littleneſs* kept unknown. *This Inſtrument* hath been exceedingly improved of late, even to the *magnifying* of Objects a *thouſand* times, and many uſeful *Theories* have been found and explicated by the *notices* it hath afforded; as appears by the *Microſcopical* Writings of thoſe ingenious *Mechanicks*, Members of the *ROYAL SOCIETY*, Dr. *Power* and Mr. *Hooke*.

But (III.) The *THERMOMETER* was another *Inſtrument* I mentioned, which diſcovers all the ſmall *unperceivable variations* in the *heat* or *coldneſs* of the *Air*, and exhibits many rare and *luciferous Phænomena*, which may help to better Informations about thoſe *Qualities*, than yet we have any. And as to this, I obſerve with the great *Verulam*, and the other *Bacon* the Illuſtrious Mr. *Boyle*, That *Heat* and *Cold* are the *right* and *left* hand of *Nature*. The *former* is the great *Inſtrument* of moſt of her Operations; and the *other* hath its *Intereſt*. And yet the *Philoſophy* of *Ariſtotle* hath neither *done* nor as much as *attempted* any thing toward the Diſcovery of their Natures;

Natures; but contented it ſelf with the *jejune*, *vulgar*, and *general* deſcription, *That Heat is a Quality that gathereth together things of a like nature, and ſevers thoſe that are unlike*; and *Cold congregates both*. But now if we will know any thing deeply in the buſineſs of *Rarefaction* and *Condenſation*, the Doctrine of *Meteors*, and other material Affairs of Nature, other Accounts about theſe things muſt be endeavoured; and the bare *informations* of our *Senſes*, are not *exact* enough for this purpoſe; for their *Reports* in this kind are *various* and *uncertain*, according to the *temper* and *diſpoſition* of our *Bodies*, and ſeveral *unobſerved accidental mutations* that happen in them. This *Inſtrument* therefore hath been invented to ſupply their *defects*; and it gives far more *conſtant* and *accurate*, though perhaps not always *infallible Relations*: but the juſteſt are afforded by the *Sealed Thermometer*. And beſides the *Uſes* of this *Inſtrument* I ſuggeſted, it will help very much in framing the *Hiſtory* of *Weather*, which may be applied to many excellent purpoſes of *Philoſophy*, and ſervices of *Life*.

CHAP.

CHAP. VIII.

Of the Barometer *and* Air-Pump, *and what Advantages we have and may further expect from* these Instruments.

BUt (IV.) The *BAROMETER* is another late *Instrument* very helpful to *Useful Knowledge*. That there is *gravity* even in the *Air* it self, and that *that Element* is only *comparatively light*, is now made evident and palpable by *Experience*, though *Aristotle* and his *Schools* held a different *Theory*: And by the help of *Quicksilver* in a *Tube*, the way is found to measure all the *degrees* of *Compression* in the *Atmosphere*, and to estimate exactly any *accession* of *weight*, which the Air receives from *Winds*, *Clouds*, or *Vapours*. To have said in Elder Times, That Mankind should light upon an Invention whereby those Bodies might be *weigh'd*, would certainly have appeared very *wild* and *extravagant*; and it will be so accounted for some time *yet*, till men have

have been *longer* and are *better* acquainted with *this Inſtrument*: For we have no reaſon to believe it ſhould have *better luck* than the *Doctrine* of the *Circulation*, the *Theory* of *Antipodes*, and all *great Diſcoveries* in their *firſt Propoſals*. 'Tis impoſſible to perſwade ſome of the *Indians* that live near the *heats* of the *Line*, that there is any ſuch thing as *Ice* in the World; but if you talk to them of *Water* made *hard* and *conſiſtent* by *Cold*, they'l laugh at you as a *notorious Romancer*. And thoſe will appear as *ridiculous* among the moſt of us, who ſhall affirm it *poſſible* to determine any thing of the *weight* of the *Wind* or *Clouds*. But *Experience* turns the *laugh* upon the *confident incredulity* of the *Scoffer*; and he that will not *believe*, needs no more for his *conviction*, than the labour of a *Tryal*. Let him then fill a *Tube* of *Glaſs* of ſome Feet in length, with *Quickſilver*; and having *ſealed* one end, let him ſtop the other with his Finger, and *immerge that* which is ſo *ſtop'd* into a *Veſſel* of *Mercury*, the *Tube* being *perpendicularly* erected; let him then ſubſtract his Finger, and he will perceive the *Quickſilver* to deſcend from the *Tube* into the *ſubjacent Veſſel*, till it comes to 29 *Digits* or thereabouts; *there*, after ſome *Vibrations*,

brations, it ordinarily *rests*. The reason that this remainder of the *Mercury* doth not *descend* also, is, because such a *Mercurial Cylinder* is just *equiponderant* to *one* of the *incumbent Atmosphere* that leans upon the *Quicksilver* in the *Vessel*, and so *hinders* a *further descent*. It is concluded therefore, That such a Cylinder of the Air as *presses* upon the *Mercury* in the *Vessel*, is of *equal weight* to about 29 *Digits* of that *ponderous Body* in the *Tube*. Thus it is when the *Air* is in its *ordinary temper*: but *Vapours*, *Winds*, and *Clouds* alter the *Standard*, so that the *Quicksilver* sometimes *falls*, sometimes *rises* in the *Glass*, proportionably to the *greater* or *less accession* of *gravity* and *compression* the Air hath received from any of those *alterations*; and the *Degree* of *increase* beyond the *Standard*, is the *measure* of the *additional gravity*. This *Experiment* was the *Invention* of *Torricellius*, and used to little more purpose at first, but to prove a *Vacuum* in Nature; and the *deserted* part of the *Glass*-Tube was by many thought an *absolute void*, which I believe is a mistake: But it hath been since improved to this Design of *weighing* the degrees of *compression* in the Air; a thing that may signifie much, in giving us to understand its *temper* in several

veral Places, on *Hills* and in *Caves*, in divers *Regions* and *Climates*, which may tend to the diſcloſing many excellent *Theories* and *helps* in *humane Life*. And the *Air* is ſo *Catholick* a Body, and hath ſo great an *influence* upon all *others*, and upon *ours*, that the advantage of ſuch an *Inſtrument*, for the better acquainting us with its *nature*, muſt needs be very conſiderable, and a good *Aid* to *general Philoſophy*. And who yet knows how *far*, and to what *Diſcoveries* this *Invention* may be improved? The World a long time only *rudely ſtar'd* upon the *Wonders* of the *Loadſtone*, before its *uſe* was found for the *advantage* of *Navigation*; and 'tis not impoſſible, but that *future Times* may derive ſo much *benefit* one way or other from *this Invention*, as may equal its *eſteem* to *that* of the *Compaſs*. The *ROYAL SOCIETY*, by their *Care* and *Endeavours* in the uſing this *Inſtrument*, give us hopes, that they will let none of its *uſeful Applications* to eſcape us. And I know not whether we may not mention it as the firſt great benefit we have from *it*, that it was an occaſion of the *Invention* of Mr. *Boyle*'s famous *Pneumatick Engine*: And this is the other *Inſtrument* I noted, and call'd

(V.) The

(V.) The *AIR-PUMP*, concerning the *uſefulneſs* of which, that excellent Perſon himſelf hath given the beſt Accounts, in his Diſcourſe of *Phyſico-Mechanical Experiments* made in that *Engine*, by which he hath diſcovered and proved a rare and *luciferous Theory*, *viz.* the *Elaſtick Power* or *Spring* of the *Air*, and by *this*, hath put to flight that *odd* Phancy of the *Fuga vacui*, and ſhewn, that the *ſtrange Effects* which uſe to be aſcribed to that *general* and *obſcure cauſe*, do ariſe from the *native ſelf-expanſion* of the Air. The extent of which *Elaſtical Expanſion*, he hath found divers ways to meaſure by his *Engine*, which alſo diſcovers the *influence* the *Air* hath on *Flame*, *Smoke*, and *Fire*; That it hath *none* in *Operations Magnetical*; That *it* is probably much *interſperſed* in the *Pores* of *Water*, and *compreſt* by the *incumbent Atmoſphere*, even in thoſe *cloſe retreats*; What operation the *exſuction* of the *Air* hath on other *Liquors*, as *Oyl*, *Wine*, *Spirit* of *Vinegar*, *Milk*, *Eggs*, *Spirit* of *Urine*, *Solution* of *Tartar*, and *Spirit* of *Wine*; The *gravity* and *expanſion* of the *Air* under *Water*; The intereſt the *Air* hath in the *vibrations* of *Pendulums*, and what it hath to do in the *propagation* of *Sounds*; That *Fumes* and

Vapours

Vapours aſcend by reaſon of the *gravity* of the *Ambient*, and not from their *own poſitive levity*; The nature of *Suction*, the *cauſe* of *Filtration*, and the riſing of *Water* in *Siphons*; The nature of *Reſpiration*, and the *Lungs* illuſtrated by tryals made on ſeveral kinds of *Animals*, and the intereſt the Air hath in the Operations of *Corroſive Liquors*. *Theſe*, and many more ſuch like *beneficial Obſervations* and Diſcoveries, hath that *great man* made by the help of his *Pneumatick Engine*; and there is no doubt but *more*, and perhaps *greater* things will be diſcloſed by *it*, when *future ingenuity* and *diligence* hath improved and perfected this Invention. (For what great thing was *abſolute* and *perfect* in its *firſt riſe* and beginning?) And 'tis like this *Inſtrument* hereafter will be uſed and applied to things yet unthought of, for the *advancement* of *Knowledge* and *conveniences* of *Life*.

Chap. IX.

The Credit of Optick-Glasses *vindicated, against a* **Disputing** *Man, who is afraid to believe his Eyes against* Aristotle.

THus, Sir, I have performed the first part of my promise, by shewing what *Advantages* the *latter Ages*, and *particularly* the *ROYAL SOCIETY*, have for *deep search* into things both by *ARTS* and *INSTRUMENTS newly invented* or *improved*, above those enjoy'd by *Aristotle* and the *Ancients*.

To my Discourse about the *Dioptrick Tubes*, the *Telescope* and *Microscope*, the **Reverend Disputer** replied, [*That our Glasses were all deceitful and fallacious.*] Which Answer minds me of the *good Woman*, who when her Husband urged in an occasion of difference, [*I saw it, and shall I not believe my own Eyes?*] Replied briskly, **Will you believe your own Eyes, before your own dear Wife?** And it

ſeems *this Gentleman* thinks it unreaſonable we ſhould *believe ours*, before his *own dear Ariſtotle*.

For an aſſurance of the *credit* of thoſe *Glaſſes*, I told him he might *try* them upon *objects near*, and *eaſily viſible* by the *unaſſiſted ſight*; and if he made the *tryal*, he would find they *altered* the *objects* in nothing but their *proportions*, which are repreſented *larger* for the advantage of *viſion* in things *ſmall* and *remote*; and we have all the like reaſons to *diſtruſt our Eyes*, as *theſe Glaſſes* (for their *informations* are the *ſame* in all things, but the *mentioned difference*) and there is no man ſo much a fool, as not to make allowances for *that*. Never was any yet ſo groſly deceived by the *Microſcope*, as to be perſwaded that a *Flea* is as *big* as a *Lobſter*; nor did the *Teleſcope* ever make any one believe that the *Moon* was at the *end* of his *Tube*: But if the *former* repreſents that *little Creature* as *briſtled* and *jamar'd*, and the *other* makes the *Planet mountanous* and *uneven*, we have no reaſon to believe but that their *reports* are *ſincere*, though our *unaided* Senſes are too *groſs* to perceive either the one or other; ſince, if the mentioned *briſtles* and *jamars* are in the *Glaſs*, and not in the *Animal*, they would

would appear in like manner in all the ſmall Creatures which in the ſame light and poſition are look'd on through the *Microſcope*: And if the *ruggedneſs* of *ſurface* were in *it*, and not in the *Moon*, the *ſame* would be ſeen upon all other *diſtant objects*, that are view'd through the other *Optick Inſtrument*. And if there be *deceit* in thoſe *Glaſſes*, Seamen had need beware how they truſt them, ſince the *Flags* which appear to be *thoſe* of their *Friends* in the *Perſpective*, may be really the *Colours* of their *Enemies*.

Upon theſe accounts, Sir, which afford *plain* and *ſenſible* evidence, I wondered much at the **Diſputers** *ſtrange ſuſpicion*, which had been ſcarce *pardonable* in a *vulgar* head; and I know not what to call it in *one*, that would be thought a *Philoſopher*: But the *wary* man gave a *reaſon*, which made me as much *wonder* at his *Argument*, as his *Doubt*. And to *this* attend Ye *Philoſophers* of the *ROYAL COLLEDGE*, and prepare your ſelves to anſwer a *Demonſtration* from *Experience*, againſt your *Glaſſes*; Raiſe your *Expectations* for a *wonderful*, *convictive Experiment*; Let the *Mountains travel*, and the *Birth* will follow. [*Take two Spectacles* (ſaith the **Experimental**

Sage) *uſe them at the ſame time, and you will not ſee ſo well as with one ſingly.*] Therefore your *Microſcopes* and *Teleſcopes* are *impoſtors*. This man, Sir, is a *Logician*, and no doubt you *perceive ſo*. O how I admire this *rare faculty* of *arguing*! How *dull* are our *Wits*, to thoſe *ſubtile*, *Eagle-ey'd Schoolmen*, who ſee *Concluſions ſo far* off, through the more *unerring Teleſcopes* of their own piercing Underſtandings? Did ever *old man* before make *this* uſe of his *Spectacles*? But to leave wondring, let's endeavour to underſtand this *Philoſophy* of **Chue**. How a man may *ſee* by *Spectacles*, that *Perſpectives* are *deceitful*. [*We can ſee better through one pair, than two*] ſaith the **Deep Philoſopher**. Moſt *ſagely* obſerv'd! The Argument *begins ſtrongly*: But in the Name of *Ariſtotle*, whence comes the *Conſequence*? *Therefore Perſpectives are fallacious.*

One Propoſition *for* Sence,
And th' other *for* Convenience.

This fits his purpoſe to diſcredit *new Diſcoveries*, 'tis no matter how it follows. This Gentleman, you muſt know Sir, uſeth to have his *word* taken among his *admiring Neighbours*,

Neighbours, and so is not wont to be put to the *trouble* of *proving*: but I was so *unmannerly* as to expect *it*, chusing rather to *see* with mine own *Eyes*, than his *infallible Spectacles*. *We can see better*—— saith the **Disputer**. How doth *he* know *that*? If *Perspectives deceive* us, though *naked sense* witness for them, Why may not his *single Spectacles* be as *deceitful* as *they*? *These* represent things *bigger* than they *are* to the *unaided sight*; and the *Philosophical Glasses* do but the *same thing*, in a *higher degree* of *magnifying* the *Object*. But we allow him the benefit of his *single Spectacles*, though he will not be so courteous to our *Glasses*, and confess his **Reverend Experiment** of the *use* of *two*, but are *inquisitive* about the *Consequence*. The *Reason* of which certainly *must be* (if any be intended in it) that our *Telescopes* and *Microscopes* have a *Glass* at each end, which the **Man** of **Sapience** thinks answers the two pair of *Spectacles*, and therfore must render the *Representation deceitful*. If this *Philosopher* had spared some of those thoughts to the *profitable* Doctrine of *Opticks*, which he hath spent upon *Genus* and *Species*, we had never heard of this *Objection*, which is as much a reason against the *credit* of all

Perſpective Glaſſes whatſoever, as the *Philoſophical* ones he would diſcredit. And without more *Opticks* than thoſe of *natural Underſtanding*, he might, if it had pleaſed him, have known, that we *ſee better* through the *two Glaſſes* in *Perſpectives*, than any *ſingle* one; becauſe they are ſo faſhioned and ordered, that the *viſive rays* are better gathered and united by them for the advantage of ſight: But in the *two Spectacles*, the caſe is contrary. Theſe things I ſuggeſted, and ſome others from the *Dioptricks*, in which this **Sage** Perſon was pleaſed then to conceal his Knowledge; and how great *that* was in theſe matters, will appear by the *Learned Problem* he propoſed at this period of our Diſcourſe, *viz.* [**Why we cannot ſee with two pair of Spectacles, better than with one ſingly?** For, ſaith the **Man** of **Axioms**, *Vis unita fortior?*] A *pleaſant* piece of *Philoſophy* this; and I'le ſhew the **Diſputer** how ſtrongly he infers from his *Maxim*, by another Queſtion like it. Why cannot he write *better* with *two Pens*, than with a *ſingle* one, ſince *Vis unita fortior*? When he hath anſwered *this Quære*, he hath reſolved his own. I ſaid in the Diſcourſe, That the reaſon he gave why one would expect

it

it should be *so*, is the reason why 'tis not; and this is plain enough to *sense*, from the *confusion* of *Vision*, which shews, that the *rays* are *not united* after the way requisite for the aiding the sight (as I just now intimated) and how that should *be*, I had here shewn, but that I am ashamed to add more in *earnest* about a **grave** *foolery*. And I confess, Sir, I account these *personal* matters a kind of Digression from the main thing I intended. To return therefore to my Subject.

Chap. X.

Our Advantages *for* Knowledge; *from* Modern *Improvements of Natural History.*

HAving discourst the modern Helps *Useful Knowledge* hath for *deep Research*, I am next

(2.) To recount what *Aids* it hath received from our *better* acquaintance with the *Phænomena*. For *this* I must consider *NATURAL HISTORY* more *particularly*,

ticularly, which is the *Repoſitory* wherein theſe are lodg'd. How *this* may be compiled in the beſt order, and to the beſt advantage, is moſt judiciouſly repreſented by the *Immortal* Lord *Bacon*; and to ſhew how highly It hath been *advanced* in *modern Times*, I need ſay little more, than to amaſs in a brief *Recollection*, ſome of the *Inſtances* of *newly-diſcovered Phænomena*, which are ſcatter'd under the Heads of the *Arts* and *Inſtruments* I have diſcours'd, with the *Addition* of ſome others: As,

In the *HEAVENS*, *thoſe* of the *Spots* and *Dinettick motion* of the *Sun*, the *mountanous protuberances* and *ſhadows* in the body of the *Moon*, about *nineteen Magnitudes* more of *Fixed Stars*, the *Lunulæ* of *Jupiter*, their *mutual Eclipſing* one another, and *its turning* round upon its own *Axis*; the *Ring* about *Saturn*, and its *ſhadow* upon the Body of *that Star*; the *Phaſes* of *Venus*, the *increment* and *decrement* of *Light* among the *Planets*, the *appearing* and *diſaprearing* of *Fixed Stars*, the *Altitude* of *Comets*, and nature of the *Via Lactea*. By *theſe Diſcoveries*, and more ſuch, the *Hiſtory* of the *Heavens* hath been *rectified* and *augmented* by the Modern Advancers of *Aſtronomy*, whom in their place I have cited.

cited. In the *AIR*, *Its Spring*, the more *accurate Hiſtory* and Nature of *Winds* and *Meteors*, and the *probable height* of the *Atmoſphere*, have been added by the *Lord Bacon*, *Des Cartes*, Mr. *Boyle*, and others. In the *EARTH*, *New Lands* by *Columbus*, *Magellan*, and the reſt of the Diſcoverers; and in theſe, *new Plants*, *new Fruits*, *new Animals*, *new Minerals*, and a kind of *other World* of *Nature*, from which *this* is ſupplied with numerous *conveniences* of *Life*, and many thouſand Families of our own *little one* are continually fed and maintained. In the *WATERS*, the *great Motion* of the *Sea*, unknown in elder Times, and the *particular* Laws of *flux* and *reflux* in many places, are diſcover'd. The *Hiſtory* of *BATHES augmented* by *Savonarola*, *Baccius*, and *Blanchellus*; of *METALS* by *Agricola*; and the whole *SUBTERRANEOUS WORLD* deſcribed by the univerſally Learned *Kircher*. The Hiſtory of *PLANTS* much improved by *Matthiolus*, *Ruellius*, *Bauhinus*, and *Gerard*, beſides the late Account of *Engliſh Vegitables* publiſh'd by Dr. *Merret*, a worthy Member of the *ROYAL SOCIETY*. And another excellent *Virtuoſo* of the ſame Aſſembly,

Aſſembly, Mr. *John Evelyn*, hath very conſiderably *advanced* the *Hiſtory* of *Fruit* and *Foreſt-Trees*, by his *Sylva* and *Pomona*; and greater things are expected from his *Preparations* for *Elyſium Britannicum*, a noble Deſign now under his hands: And certainly the *inquiſitive World* is much indebted to this *generous* Gentleman for his very *ingenious* Performances in *this* kind, as alſo for thoſe others of *Sculpture*, *Picture*, *Architecture*, and the like *practical*, *uſeful* things with which he hath inrich'd it. The *Hiſtory* of *ANIMALS* hath been much inlarged by *Geſner*, *Rondeletius*, *Aldrovandus*, and more accurately inquir'd into by the *Micrographers*: And the *late* Travellers, who have given us Accounts of thoſe *remote* parts of the *Earth*, that have been leſs known to *theſe*, have deſcribed great *variety* of *Living Creatures*, very different from the *Animals* of the *nearer Regions*; among whom the *ingenious* Author of the *Hiſtory* of the *Caribbies* deſerves to be mentioned as an Inſtance. In our own *BODIES Natural Hiſtory* hath found a rich heap of Materials in the above-mentioned Particulars of the *Venæ Lacteæ*, the *Vaſa Lymphatica*, the *Valves* and *Sinus* of the *Veins*, the ſeveral *new Paſſages* and *Glandules*,

glandules, the *Ductus Chyliferus*, the *Origination* of the *Nerves*, the *Circulation* of the *Blood*, and the rest. And all the main heads of *Natural History* have receiv'd *aids* and *increase* from the famous *Verulam*, who led the way to *substantial Wisdom*, and hath given most excellent *Directions* for the Method of such an *HISTORY* of *NATURE*.

CHAP. XI.

The Advantages *of* late *Ages for* spreading *and* communicating *Knowledge. Three great Instances of it, in* Printing, *the* Compass, *and the* Royal Society.

THus, Sir, I have dispatch'd the *FIRST Part* of my *Method* proposed in the *beginning*; but stand yet ingaged for the *other*, which is to shew,

(II.) That the *later* Ages since *Aristotle* have had great *advantages* of him, in respect of Opportunities and Helps for the *spreading* and *communicating Knowledge*, and

and thereby of *improving* and *enlarging it*. And methinks the very mention of *Age* and *Ariſtotle*, by way of *compariſon* in this caſe, hath ſo much of *abſurdity* in it, that I am almoſt aſhamed to proceed further in the proof of ſuch a Propoſition as this, viz. *That the Advantages of Mankind in the Succeſſion of two thouſand years, are more than thoſe of a ſingle Perſon who lived but ſixty three.* Certainly thoſe that have the fondneſs to think the contrary, have a Faith that exceeds all the *Extravagancies* of *Fiction*: For never any *Romance* was ſo *abſurdly vain*, as to *feign* an *Heroe* whoſe *ſingle ſtrength* and *valour* exceeded *Armies* of other Mortals. And 'tis not leſs *abſurd* to ſuppoſe the *Wit* of *one* man, and *he* an *Idolater* and an *Heathen*, to tranſcend the *joynt* Underſtandings of all the *wiſer* World, though *aſſiſted* by *his Knowledge*, the *Light* of *Chriſtianity*, and the *aggregated Informations* and *Endeavours* of many *Learned Ages*: But my **Reverend Oppoſite** had this belief, and hath thereby out-done the largeſt *exceſſes* of *Poetry*. For *his* ſake therefore, and *thoſe* others that are of *this* more than *hyperbolical Faith*, I add the *SECOND Part* of my propoſed *Method*, though what I have ſaid already upon

upon the *First*, is, I judge, more than sufficient for that purpose; And yet I think it not impertinent to subjoyn those other *Considerations*, both because they will further discover the unreasonable vanity of the *doating* Spirits, that oppose all *generous Endeavours* for the *advance* and *improvement* of *Knowledge*; and (which may signifie more) will *excite* and *encourage Hopes* of *Modern Attempts*: and *Hope* is the *fuel* of *Activity* and *Endeavour*.

I descend to demonstrate then by *palpable* and *undeniable Instances*, That we have *Advantages* above *Aristotle*, and, which is much more, *above* all elder Times, for *mutual Communications*, and *impartments* of our *Notices*, *Observations*, *Experiments*, and *Performances* for the *increase* of *Science*. My *Instances* are THREE, *PRINTING*, the *COMPASS*, and the *ROYAL SOCIETY*.

For the FIRST, *PRINTING*, It was, according to *Polydore Vergil*, the *Invention* of *John Cuthenberg* of *Mentz* in *Germany*, though others give the honour to one *Fust* of the same City, and some to *Laurentius* a Burger of *Haerlem*. But whoever was the *Author*, this is agreed, That this excellent *Art* was *first practiced* about the

the year 1440. and was utterly *unknown* i *elder Times*; at leaſt in all the parts of th World that are on this ſide the Kingdom o *China*, which they ſay had it more *early* but it ſignifies not to our purpoſe. Nov by reaſon of the *Ancients* want of *this In vention*, *Copies* of excellent things coul not be ſo much *diſperſed*, nor ſo well *pre ſerv'd* either from the *Corruptions* of *Tim* or *Deſign*. The *Charge* of *Books* was ver *great*, *forgeries frequent*, and *miſtakes* o *Tranſcribers numerous*. They were quickl ſwept away out of thoſe few *Libraries* i which they were, by *Fire* and *Violence*, o *ſpoiled* by *Duſt* and *Rottenneſs*. And in th *abſence* of this *Art*, 'twas eaſie enough fo one *Ariſtotle* to *deſtroy* the moſt conſidera ble *Remains* of the *Ancients*, that the powe of his *great* Scholar put into his hands which, 'tis credibly reported of him, tha he did, to procure more *Fame* for his *own* Performances: as alſo to *conceal* his *theft* and *injurious* dealings with thoſe *venerable* Sages, whom he ſeems to take a great de light to *contradict* and *expoſe*, as I have elſe where proved. But *now*, by this *excel lent Invention*, the Knowledge that i lodged in *Books*, is put beyond the danger of ſuch *Corruptions*, *Forgeries*, or any *fatal*

incon-

inconvenience. We *communicate* upon *eaſie* terms at the *remoteſt diſtance*, *converſe* with the *wiſemen* that went *before* us, and *ſecurely* convey down our Conceptions to the *Ages* that ſhall follow. So that by this means *Knowledge* is advantageouſly *ſpread* and *improved*; eſpecially ſince the *Aſſiſtance modern Ingenuity* hath brought us, in that other *admirable Invention*,

(2.) The *COMPASS.* How *defective* the *Art* of *Navigation was* in *elder* Times, when they *Sailed* by the *obſervation* of the *Stars*, is *eaſie* to be *imagin'd*: For in dark weather, when their *Pleiades*, *Helice*, and *Cynoſura* were hidden from them by the *intervening Clouds*, the *Mariner* was at a loſs for his *Guide*, and expoſed to the *caſual* conduct of the *Winds* and *Tides*. For which reaſon the *Ancients* ſeldom or never durſt venture into the *Ocean*, but ſteer'd along within ſight of the *ſafer* Shore. So that the *Commerce* and *Communications* of *thoſe Days* were very *narrow*; Their *famed Travels* in *compariſon* were but *domeſtick*; and a *whole World* was to *them* unknown. But it hath been the happy priviledge of *later* Days to find the way to apply the *wonderful Vertues* of the *Loadſtone* to *Navigation*; and by the direction of the

Compaſs

Compaſs we ſecurely commit our ſelves t
the *immenſe Ocean*, and find our path i
the *vaſteſt Wilderneſs* of *Waters*. So tha
Commerce and *Traffique* is infinitely *impr*
ved, the *other* half of the Globe *diſcloſe*
and *that* on this ſide the *great Sea better* un
derſtood. The *Religions*, *Laws*, *Cuſtom*
and all the *Rarities* and *Varieties* of *Art* an
Nature, which any the moſt diſtant Clim
knows and enjoys, are *laid open* and mad
common; and thereby the *Hiſtory* of *Natur*
is wonderfully *inlarged*, and *Knowledge* i
both *propagated* and *improved*.

Who it was that *firſt* diſcovered thi
excellent *Myſtery*, is not certainly known
But one *Flavius Goia* of *Amalphis* in th
Kingdom of *Naples*, is ſaid to be the *Au-*
thor; and to have found this incomparable
Rarity about 300 years ago. 'Tis pity
that one of the *greateſt Benefactors* to man-
kind that ever was, ſhould lie hid in ſo *ne-*
glected an *obſcurity*; when the great *Trou-*
blers of the World, who have vex'd it by
the *wars* of the *Hand* and of the *Brain*, have
ſo *dear* and ſo *precious* a Memory. For my
part I think there is more acknowledgment
due to the name of this *obſcure* Fellow,
that hath ſcarce *any* left, than to a thou-
ſand *Alexanders* and *Caeſars*, or to ten times

the

the number of *Aristotles.* And *he* really *did more* for the *increase* of *Knowledge,* and *advantage* of the World by this one *Experiment*, than the numerous *subtile Disputers* that have lived ever since the *erection* of the *School* of *talking.*

And methinks it may not be improper for me here to take notice of that other great *German Invention,* that useth to be mentioned in the Company, *viz. That* of *GUNPOWDER* and *ARTILLERY*, which hath done its *Service* also for the *help* and *propagation* of *Knowledge*, as you will perceive, when you shall consider; that by the assistance of these *terrible Engins* of *Death*, the great *Western Indies* were presently subdued, which likely had not been so easily effected by the *ancient* and *ordinary Methods* of *War.* 'Twas this *Thunder* and *Lightning*, and the *invisible Instruments* of *Ruine*, that destroyed the *Courage* of those *numerous* and *hardy People*, took away the *hearts* of the *strongest Resisters*, and made them an *easie prey* to the *Conquering Invaders.*

And now by the gaining that mighty *Continent*, and the numerous *fruitful Isles* beyond the *Atlantick*, we have obtained a *larger* Field of *Nature*, and have thereby

an *advantage* for *more Phænomena*, and *more helps* both for *Knowledge* and for *Life*, which 'tis very like that *future Ages* will make better uſe of to ſuch purpoſes, than thoſe hitherto have *done*; and that *Science* alſo may at laſt travel into *thoſe* parts, and inrich *Peru* with a more *precious Treaſure* than *that* of its *golden* Mines, is not improbable. And ſo theſe *Engines* of *Deſtruction*, in a *ſenſe* too are *Inſtruments* of *Knowledge*. Of the *firſt Author* of *this Experiment* we know no more, but that he was a *German Monke*, who lighted on it *chance*, when he was making ſome *Chymical Tryals* with *Nitre*, near about the time of the *Invention* of the *Compaſs*; but his *Name* and other *Circumſtances* are loſt.

Now whoever conſiders, with the Noble *Verulam*, how much the *ſtate* of things in the World hath been *altered* and *advanced* by theſe *THREE EXPERIMENTS* alone, will conceive great hopes of Modern *Experimental Attempts*, from which greater matters may be looked for, than *thoſe* which were the *Inventions* of *ſingle Endeavourers*, or the *reſults* of *Chance*.

And of all the *Combinations* of Men that ever met for the *Improvement* of *Science*, therewere never any whoſe *Deſignes* were

better

better laid, whose *Encouragements* were *greater*, whose *Abilities* were more *promising*, or whose *Constitution* was more *judiciously* or *advantageously* formed, than the *ROYAL SOCIETY*.

Chap. XII.

Of the ROYAL SOCIETY. The Reasons of the Institution, and their Designs. An Answer to the Question, What have they done?

THIS Noble *Institution*, Sir, was the *THIRD Advantage* I mentioned, that the *Modern World* hath for the *Communication* and *Increase* of *Knowledge*. And just as I am come to *this Particular* of my Method, I find I am happily prevented, and see I need not say much about it; For their *HISTORY*, that is newly come abroad, gives *so full* and *so accurate* an Account of them and their *Designs*, that perhaps it may be *superfluous* to do more in *This*, than to recommend that *excellent*

Diſcourſe to your peruſal, which I do with ſome more than ordinary zeal and concernment, both becauſe the Subject is one of the moſt weighty and conſiderable that ever afforded matter to a *Philoſophical* Pen, and becauſe it is writ in a way of ſo *judicious* a *gravity*, and ſo *prudent* and *modeſt* an *expreſſion*, with ſo much *clearneſs* of *ſenſe*, and ſuch a *natural fluency* of *genuine eloquence*: ſo that I know it will both *profit* and entertain you. And I ſay further, that you may remember to do your ſelf this right, That the *Style* of that Book hath all the *properties* that can recommend any thing to an *ingenious reliſh*: For 'tis *manly*, and yet *plain*; *natural*, and yet not *careleſs*: The *Epithets* are *genuine*, the *Words proper* and *familiar*, the *Periods ſmooth* and of *middle* proportion: It is not *broken* with *ends* of *Latin*, nor *impertinent Quotations*; nor made *harſh* by *hard* words, or *needleſs terms* of *Art*: Not rendred *intricate* by long *Parentheſes*, nor *gaudy* by *flanting Metaphors*; not *tedious* by *wide fetches* and *circumferences* of *Speech*, nor *dark* by too much *curtneſs* of *Expreſſion*: 'Tis not *looſe* and *unjointed*, *rugged* and *uneven*; but as *polite* and as *faſt* as *Marble*; and briefly, avoids all the *notorious defects*, and wants none of the

the *proper ornaments* of Language. I ſay, *proper*; for Styles are *Cloathes* that muſt be fitted to the Subjects they are upon, and altered according to the *different kinds* of things they deſcribe and expreſs.

Thus, Sir, you ſee I am not infected with that baſe Envy, that always ſpeaks detractingly or ſparingly of the moſt worthy Performances of *Contemporaries*. And becauſe of this general ill nature in *Mankind*, few men can *bear* large commendations of others, though they are never ſo *juſt*; but will endeavour to find all the *faults* that *malicious* Wit can ſuggeſt, againſt any thing which hath a great *character* of worth upon it, eſpecially if it be of *modern date*; a *baſeneſs* which no doubt hath been a great diſcouragement to many noble Deſigns and Endeavours. For my part, I thank God, I am inclined by my *particular complexion*, as well as by my *Reaſon*, to take as much *pleaſure* to do *right* to the *deſerts* of excellent Things and Perſons, as ſome are to *malign* and *defame* them; and in what I have ſaid on this occaſion, I have not only gratified that humour, but I hope done you a kindneſs, by diſpoſing you to a careful reading of what I have ſo earneſtly recommended: And in *that* you will ſee

what were the Reaſons of forming ſuch a *Combination* as the *ROYAL SOCIETY*, what is the *Nature* of that *Conſtitution*, what are their *Deſigns*, and *what they have done*. You'l find there a *Collection* of ſome (among numerous others that are in their *Repoſitory*) of the *Experiments*, *Obſervations*, and *Inſtruments* which they have invented and advanced for the *Improvement* of *real*, *uſeful* Knowledge, and a full *vindication* of the Deſign, from the *dark ſuſpicions* and *objections* of *jealouſie* and *ignorance*.

BUT that I may not wholly refer you, which may look lik a put-off, I'le here offer you ſomething for a preſent ſtay to your *Appetite*, concerning this *Eſtabliſhment*, as it is an *Advantage* for the *communication* and *increaſe* of *Science*. I ſay then, That it was obſerved by the excellent Lord *Bacon*, and ſome other *ingenious Moderns*, That *Philoſophy*, which ſhould be an *Inſtrument* to *work* with, to find out thoſe *Aids* that *Providence* hath laid up in nature to help us againſt the *inconveniences* of *this* State, and to make ſuch *applications* of things as may tend to *univerſal benefit*. I ſay, They took notice, that inſtead of ſuch a *Philoſophy* as *this*, *That* which had *uſurp'd* the *Name*, and

obtained

obtained in the *Schools*, was but a *combination* of *general Theories* and *Notions*, that were concluded *raſhly*, without *due information* from *particulars*, and ſpun out into unprofitable *niceties*, that tend to *nothing* but *Diſpute* and *Talk*, and were never like to advance any *Works* for the *benefit* and *uſe* of men.

This being conſider'd, the *deep* and *judicious Verulam* made the *complaint*, repreſented the *defects* and unprofitableneſs of the *Notional* way, propoſed *another* to *reform* and inlarge *Knowledge* by *Obſervation* and *Experiment*, to *examine* and *record Particulars*, and ſo to riſe by degrees of *Induction* to *general Propoſitions*, and from *them* to take *direction* for *new Inquiries*, and *more Diſcoveries*, and other *Axioms*; that our Notions may have a *Foundation* upon which a *ſolid Philoſophy* may be built, that may be *firm*, *tite*, and cloſe *knit*, and ſuted to the *Phænomena* of things: So that *Nature* being *known*, it may be *maſter'd*, *managed*, and *uſed* in the Services of humane Life.

This was a *mighty Deſign*, *groundedly laid*, *wiſely expreſt*, and *happily recommended* by the *Glorious Author*, who *began nobly*, and *directed* with an *incomparable con-*

duct of *Wit* and *Judgment*: But to the carrying it on, It was neceſſary there ſhould be many *Heads* and many *Hands*, and *Thoſe* formed into an *Aſſembly*, that might *intercommunicate* their *Tryals* and *Obſervations*, that might joyntly *work*, and joyntly *conſider*; that ſo the *improvable* and *luciferous Phænomena*, that lie ſcatter'd up and down in the *vaſt Champaign* of *Nature*, might be *aggregated* and brought into a *common* ſtore. This the *Great* Man *deſired*, and form'd a *SOCIETY* of *Experimenters* in a *Romantick Model*, but could do no more; His time was not ripe for ſuch Performances.

Theſe things therefore were conſider'd alſo by the later *Virtuoſi*, who ſeveral of them *combined* together, and ſet themſelves on work upon this *grand* Deſign; in which they have been ſo happy, as to obtain the *Royal Countenance* and *Eſtabliſhment*, to gather a great Body of *generous* Perſons of all *Qualities* and ſorts of *Learning*, to overcome the *difficulties* of the *Inſtitution*, and to make a very encouraging and hopeful *progreſs* in their purſuits. For the account of which particulars, I refer you to the *Hiſtory*, and only take notice, How ignorantly thoſe *raſh* and *inconſiderate* people talk,

talk, who speak of this *Assembly* as a company of men whose only aim is to set up some *new Theories* and *Notions* in *Philosophy*; whereas indeed, Their *first* and *chief* Imployment is, carefully to *seek* and faithfully to *report* how things are *de facto*; and They continually declare against the *establishment* of *Theories*, and *Speculative Doctrines*, which they note as one of the most considerable *miscarriages* in the *Philosophy* of the Schools: And their business is not to *Dispute*, but *Work*. So that those others also that look on them as pursuing *phancyful Designs*, are as *wide* and *unjust* in their ill-contriv'd *Censure*: Since Their *Aims* are to free *Philosophy* from the vain *Images* and *Compositions* of *Phansie*, by making it *palpable*, and bringing it down to the *plain objects* of the *Senses*; For those are the *Faculties* which they employ and appeal to, and complain that *Knowledge* hath too long hover'd in the *clouds* of *Imagination*. So that methinks this *ignorant Reproach* is, as if those that doated on the *Tales* of the *Fabulous Age*, should clamour against *Herodotus* and *Thucydides* as idle *Romancers*. For the main *intendment* of this *Society* is to erect a well-grounded *Natural History*, which takes off the *heats* of *wanton Phansie*,

ſie, hinders its *extravagant excurſions*, and ties it down to *ſober Realities*.

But this, Sir, I only touch *en paſſant*; and though I am not cloſe upon the *main* thing I intend, yet I cannot forbear taking notice of an *inſulting Objection* that we hear frequently in this *Queſtion*, **What have they done?**

To this I could *anſwer* in ſhort (as I have once already *ſuggeſted*) more than all the *Philoſophers* of the *Notional way*, ſince *Ariſtotle* opened his *Shop* in *Greece*. Which Saying may perhaps look to ſome like a *fond* and *bold* Sentence: but whoever compares the *Repoſitory* of *this Society*, with all the *Volumes* of **Diſputers**, will find it neither immodeſt nor unjuſt. And their *Hiſtory* hath given us Inſtances ſufficient of their *Experiments*, *Obſervations*, and *Inſtruments*, to juſtifie a bolder Affirmation. But I inſiſt not on *this*: The thing I would have you obſerve is, That thoſe who make the *captious Queſtion*, do not comprehend the *vaſtneſs* of the Work of this *Aſſembly*, or have ſome *phantaſtical Imaginations* of *it*. They conſider not the *Deſign* is laid as *low* as the *profoundeſt Depths* of Nature, and reacheth as *high* as the *uppermoſt Story* of the *Univerſe*; That it extends to all

the

the *Varieties* of the *great World*, and aims at the benefit of *universal Mankind*. For could they expect that such *mighty Projects* as *these* should *ripen* in a *moment*? Can a *Cedar* shoot up out of the *Earth* like a *blade* of *Grass*? or an *Elephant* grow to the *vastness* of his *bulk*, as soon as a little *Insect* can be form'd of a *drop* of *Dew*?

No; The *true* knowledge of *general Nature*, like *Nature* it self in its noblest *compositures*, must proceed *slowly*, by degrees almost *insensible*: and what *one* Age can do in so *immense* an Undertaking as *that*, wherein all the generations of Men are concerned, can be little *more* than to remove the *Rubbish*, lay in *Materials*, and *put* things in *order* for the *Building*. *Our work* is to *overcome prejudices*, to *throw aside* what is *useless*, and yields no advantage for *Knowledge* or for *Life*; To perswade men that there is *worthier Imployment* for them, than *tying knots* in *bulrushes*; and that they may be better *accommodated* in a *well-built House*, than in a *Castle* in the *Air*. We must *seek* and *gather*, *observe* and *examine*, and *lay up* in *Bank* for the Ages that come after. *This* is the business of the *Experimental Philosophers*; and in these Designs a *progress* hath been made sufficient to satisfie

sober

ſober expectations: But for *thoſe* that look they ſhould give them the *Great Elixir*, the *Perpetual Motion*, the way to make *Glaſs malleable*, and Man *immortal*; or they will object that the *Philoſophers* have done nothing: for ſuch, I ſay, their *impertinent Taunts* are no more to be regarded, than the little *chat* of *Ideots* and *Children*.

Chap. XIII.

An Account of what hath been done by the Illuſtrious Mr. Boyle *for the promotion of* Uſeful *Knowledge.*

But, Sir, I think I am fallen into things of which the *Ingenious Hiſtorian* hath ſomewhere given better *accounts*, and therefore I *draw* off; though before I quite take leave of this *Head* of my Diſcourſe, I think fit yet further to ſhew the *injuſtice* of the Reproach of having *done nothing*, as 'tis applied to the *Royal Society*, by a *ſingle* Inſtance in one of their *Members*, who alone hath done enough to oblige all Mankind, and to erect an *eternal*

Monument

Monument to his *Memory*. So that had this *great Person* lived in those days, when men *Godded* their *Benefactors*, he could not have miss'd one of the first places among their *deified Mortals*. And you will be convinc'd that this is not *vainly* said, when I have told you, I mean the *Illustrious* Mr. *BOYLE*, a Person by whose proper Merits that noble Name is as much *adorned*, as by all the *splendid Titles* that it wears. And that *this Honourable Gentleman* hath done such things for the *benefit* of the *World*, and *increase* of *Knowledge*, you will see, if you converse with him in his *excellent* Writings, where you will find the greatest *strength* and the *gentilest smoothness*, the most *generous* Knowledge and the *sweetest* Modesty, the *noblest* Discoveries and the *sincerest* Relations, the *greatest* Self-denial and the *greatest* Love of Men, the *profoundest* insight into *Philosophy* and *Nature*, and the most *devout*, *affectionate* Sense of *God* and of *Religion*. And in saying all this, I do not fear the *Envy* that *great praise* excites; for that cannot be so *impudent* to deny the *justice* of *this acknowledgment*.

But, Sir, I consider the commendation of this *incomparable Person* was not the thing

thing I undertook; but a *ſuccinct* and *general repreſentation* of his *Philoſophical Performances*: And to *that* I now addreſs my ſelf, without more *Preface*.

(1.) In his *Book* of the *AIR*, we have a great *improvement* of the *Magdeburg Experiment*, of emptying *Glaſs Veſſels* by *exſuction* of the *Air*, to far greater degrees of *evacuation*, *eaſe*, and *conveniences* for *uſe*; as alſo an *advance* of *that* other *famous* one of *Torricellius*, performed by the *New Engine*, of which I have ſaid ſome things *above*, and call'd the *AIR-PUMP*. By *this Inſtrument* (as I have already intimated) the *Nature*, *Spring*, *Expanſion*, *Preſſure*, and *Weight* of the *Air*; the *decreaſe* of its *force* when *dilated*, the *Doctrine* of a *Vacuum*, the *Height* of the *Atmoſphere*, the *Theories* of *Reſpiration*, *Sounds*, *Fluidity*, *Gravity*, *Heat*, *Flame*, the *Magnet*, and ſeveral other *uſeful* and *luciferous* Matters, are eſtimated, illuſtrated, and explain'd.

And (2.) The great Doctrine of the *Weight* and *Spring* of the *Air* is ſolidly vindicated and further aſſerted by the Illuſtrious *Author*, in another *BOOK* againſt *HOBS* and *LINUS*.

(3.) In his *PHYSIOLOGICAL* and *EXPERIMENTAL ESSAYS*, he

he nobly encourageth and perſwades the making of *Experiments*, and collecting *Obſervations*, and gives the *neceſſary Cautions* that are to be uſed in ſuch *Deſigns*. He imparts a very conſiderable *luciferous Experiment* concerning the *different parts* and *redintegration* of *Salt-petre*; whence he deduceth, That *motion*, *figure*, and *diſpoſition* of parts, may ſuffice to produce all the *ſecondary affections* of Bodies; and conſequently, That there is no need of the *ſubſtantial Forms* and *Qualities* of the Schools. To this he adds a cloſe *Hiſtory* of *Fluidity* and *Firmneſs*, which tends mightily to the *elucidating* thoſe uſeful *Doctrines*.

(4.) In his *SCEPTICAL CHYMIST* he cautions againſt the ſitting down and acquieſcing in *Chymical* and *Peripatetical Theories*, which many *do*, to the great hinderance of the *growth* and *improvement* of Knowledge. He therefore adviſeth a more *wary* conſideration and *examen* of thoſe *Doctrines*, before they are ſubſcribed; and for that purpoſe he aſſiſts them with many very conſiderable *Obſervations* and *Experiments*.

(5.) In his *USEFULNESS of EXPERIMENTAL PHILOSOPHY* he makes it appear how much *that* way

way tends to the *advance* of the *Power* and *Empire* of *Man* over the *Creatures*, and the *univerſal* Benefit of the World; confirming and illuſtrating his Diſcourſe with innumerable *new* and *uſeful Diſcoveries*.

(6.) In his *HISTORY* of *COLD*, he hath to wonder *cultivated* that *barren* Subject, and improved it (as is noted by the *Philoſophical Tranſactions*) by neer 200 choice *Experiments* and *Obſervations*. He hath there given an account of the *defectiveneſs* of common *Weather-Glaſſes*, the Advantages of the new *Hermetical Thermometers*, and an Inquiry concerning the cauſe of the *Condenſation* of the *Air*, and *Aſcent* of Water by *Cold* in the ordinary *Weather-wiſers*; All which afford valuable *Conſiderations* of *light* and *uſe*. But theſe are only *Preliminaries*: The *main* Diſcourſe preſents us with an Account *what Bodies* are capable of *freezing* others, and *what* of *being frozen*; The ways to eſtimate the *degrees* of *coldneſs*; How to meaſure the *intenſeneſs* of *Cold* produced by *Art*, beyond *that* imploy'd in ordinary *Freezing*; In *what* proportion Water will be made to *ſhrink* by *Snow* and *Salt*; How to *meaſure* the change produc'd in Water between the *greateſt heat* of Summer, the *firſt degree*

of

of *Winter-cold*, and the *highest* of *Art*; How to discover the *differing* degrees of *Coldness* in *different* Regions. A way of *freezing* without danger to the Vessel. What may be the *effects* of *Cold*, as to the preserving or destroying the *texture* of Bodies. Whether *specifick Vertues* of *Plants* are lost through *congelation*, and then *thawing*. Whether *Electrical* and *Magnetick* Vertues are altered by *Cold*. The *expansion* and *contraction* of Bodies by *freezing*; how they are *caused*, and how their *quantity* is to be *measured*. The strength of the *expansion* of *Water freezing*, and an *Inquiry* into the *Cause* of that *prodigious force*. The *Sphere* of *Activity* of *Cold*. How far the *Frost* descends in Earth and Water. An *Experiment* shewing whether *Cold* can act through an *hot medium*. A way of accounting the *solidity* of *Ice*, and the *strength* of the *adhesion* of its *parts*: What *Liquors* are its *quickest Dissolvents*. An Experiment of *heating* a *cold Liquor* with *Ice*. *These*, and many more such instructive and useful things, are contained in that excellent Discourse: To which is annex'd a very ingenious Examination and Disproof of the common obscure Doctrine of *Antiperistasis*, and Mr. *Hobbs* his *Notion* of *Cold*.

(7.) In his *EXPERIMENTAL HISTORY* of *COLOURS*, he hath laid a foundation in 150 *Experiments* at leaſt, for *grounded Theory* about theſe matters. He hath ſhewn the grand miſtake of the common belief, That *Colours inhere* in their *Objects*; and proved they depend upon *diſpoſition* of the *external parts*, and the more *inward texture* of Bodies. He hath *ſtated* and *explained* wherein the *Diſparity* conſiſts between the *Real* and *Exphatical*; explicated the Nature of *Whiteneſs* and *Blackneſs*; rectified ſome *Chymical Principles*; *compounded* Colours by trajecting the *Solar Beams* through *tinged Glaſſes*; ſhewed how by certain *Tinctures* it may be known, whether any *Salt* be *acid* or *ſulphureous*. Hath proved, there is no neceſſity of the *Peripatetick FORMS* for the production of *Colours*, by making *Green* by nine kinds of *mixtures*; compounded Colours *real* and *phantaſtical*; turned the *Blew* of *Violets* by *acid Salts* into a *Red*, and by the *alcalizate* into a *Green*; and performed many other extraordinary things on this Subject, for the *advantage* of Knowledge and the *uſes* of Life.

(8.) In his *HYDROSTATICAL PARADOXES* he ſhew'd, That the *lower*

lower parts of *Fluids* are pres's'd by the *upper*; That a *lighter* may *gravitate* upon one that is more *ponderous*; That if a Body *contiguous* to *it*, be lower than the *highest* level of the *Water*, the lower end of the *Body* will be pres's'd *upwards* by the *Water beneath*; That the *weight* of an *external Fluid* sufficeth to raise the *Water* in *Pumps*; That the *pressure* of an *external Fluid* is able to keep an *Heterogeneous Liquor suspended* at the same *height* in several *Pipes*, though they are of different *Diameters*; That a Body under Water that hath its *upper surface parallel* to the *Horizon*, the direct pressure it sustains is no more than *that* of a *Columne* of Water, which hath the mentioned *Horizontal Superficies* for its *Basis*. And if the *incumbent* Water be contained in *Pipes* open at both ends, the pressure is to be estimated by the *weight* of a *Pillar* of *Water*, whose *Basis* is *equal* to the *lower Orifice* of the *Pipe* (*parallel* to the *Horizon*) and its *height* equal to a *Perpendicular*, reaching to the *top* of the *Water*, though the *Pipe* be much *inclined*, *irregularly* shaped, and in some parts *broader* than the Orifice; That a Body in a *Fluid* sustains a *lateral pressure* from it, which increaseth in proportion to the *depth* of the *immerst* Body in the *Fluid*; That *Water* may

be made to *depreſs* a Body *lighter* than it ſelf; That a parcel of *Oyl lighter* than *Water*, may be kept from *aſcending* in it; That the cauſe of the aſcenſion of *Water* in *Syphons*, may be explained without the *notion* of *abhorrence* of a *Vacuum*; That the *heavieſt Body known* will not ſink of it ſelf, without the aſſiſtance of the *weight* of the *Water* upon it, when 'tis at a *depth* greater than twenty times its own *thickneſs*, though it *will nearer* the *Surface.*

This is the ſum of the general Contents of *that Diſcourſe*, which contains things very uſeful to be known for the advantage of *Navigation*, *Salt-works*, *Chymiſtry*, and other *practical* purpoſes.

(9.) In his Book of the *ORIGINE* of *FORMS* and *QUALITIES*, he delivers the minds of men from the *imaginary* and *uſeleſs Notions* of the *Schools* about them, which have no *foundation* in the *nature* of things, nor do any ways promote Knowledge, or help Mankind; but very much diſſerve thoſe great intereſts, by ſetting the Underſtanding at reſt in *general obſcurities*, or imploying it in *aiery niceties* and *Diſputes*, and ſo hindring its purſuit of *particular Cauſes*, and *Experimental Realities.* In *this* Treatiſe he lays the *Foundations*

and

and delivers the *Principles* of the *Mechanick Philosophy*, which he strengthneth and illustrates by several very *pleasant* and *instructive Experiments*. He shews, That the most admirable Things which have been taken for the *Effects* of *substantial Forms*, and are used as proofs of the *Notional Hypotheses*, may be the results of the meer *texture* and *position* of *parts*; since *Art* is able to make *Vitriol*, as well as *Nature*; and Bodies by *humane skill* may be produced, whose supposed *Forms* have been destroyed. He gives many very ingenious instances to prove, That the *Mechanick motions* and *order* of the *Parts* is sufficient to yield an account of the *difference* of *Bodies*, and their *affections*, without having recourse to the *Forms* and *Qualities* of the Schools; as in the *restoration* of *Camphire* to its former *smell* and *nature*, after its *dissolution* and seeming *extinction*; in the *changes* of the *colour*, *consistence*, *fusibleness*, and other *Qualites* of *Silver* and *Copper*; in the *odd Phænomena* of a certain *anomalous Salt*, and *those* of the *Sea-salt*, dried, powder'd, and mix'd with *Aqua-fortis*; and in the *Sal mirabilis*, in the production of Silver out of Gold by his *Menstruum Peracutum*, in the *transmutation* of *Water*

into *Earth* in a certain *Diſtillation* of *Spirit* of *Wine* and *Oyl* of *Vitriol*. I ſay, This excellent Gentleman hath by *Experiments rare* and *new* about theſe Subjects, made it evidently appear, That the *internal motions*, *configuration*, and *poſture* of the *parts*, are *all* that is *neceſſary* for *alterations* and *diverſities* of *Bodies*; and conſequently, That *ſubſtantial* Forms and *real Qualities* are *needleſs* and *precarious* Beings.

Chap. XIV.

A further Account of what that Gentleman of Honour hath by him, not yet publiſh'd, for the Advantage and Improvement of Real *Knowledge. The Reaſons we have to hope great Things from the* Royal Society.

THeſe, Sir, are ſome *brief* and *general* Hints of thoſe great things this incomparable Perſon hath done for the *information* and *benefit* of Men; and beſides them,

them, there are several others that He hath *by* him, and the Inquisitive expect, in which *real Philosophy* and the World are no less concern'd. I received a late Account of them from an ingenious Friend of his, Mr. *Oldenburgh*, *Secretary* to the *ROYAL SOCIETY*, who also renders himself a great *Benefactor* to *Mankind*, by his *affectionate* care, and *indefatigable* diligence and endeavours, in the maintaining *Philosophical* Intelligence, and promoting the Designs and Interests of *profitable* and *general* Philosophy. And *these* being some of the *Noblest* and most *Publick* Imployments, in which the Services of generous Men can be ingaged, *loudly* call for their *Aids* and *Assistances*, for the carrying on a Work of so *universal* an *importance*.

But I shall have a fitter place to speak of *this*, and therefore I return to the *Illustrious* Person of whom I was discoursing. And for *Philosophical News*, and further *evidence* of the *Obligation* the World hath to this *Gentleman* of *Honour*, I shall give you the *List* of what he hath *more*, yet *unpublish'd*, for its advantage and instruction. And I take the boldness to do it, because himself hath been pleased to *quote* and refer to those Discourses in his publish'd Writings; con-

cerning which, the generous *Secretary's* Account is more *particular*, and he receiv'd it from the Noble Author's *immediate* information. It ſpeaks thus.

(1.) Another *Section* of the *Uſefulneſs* of *Experimental Philoſophy*, as to the *Empire* of *Man* over *inferiour* Creatures; where he intends to premiſe ſome *general Conſiderations* about the *Means* whereby *Experimental Philoſophy* may become *uſeful* to Humane Life; proceeding thence to ſhew, That the *Empire* of *Man* may be promoted by the *Naturaliſts* skill in *Chymiſtry*, by his skill in *Mechanicks*, or the *Application* of *Mathematicks* to *Inſtruments* and *Engins*; by his skill in *Mathematicks*, both *pure* and *mixt*: That the *Goods* of Mankind may be much increaſed by the *Naturaliſt's* inſight into *Trades*; That the *Naturaliſt* may much advantage men, by exciting and aſſiſting their *curioſity* to *diſcover*, *take notice*, and make *uſe* of the *home-bred Riches* and Advantages of *particular* Countries, and to increaſe their number, by transferring thither *thoſe* of others; That a *ground* of high *expectation* from *Experimental Philoſophy* is given, by the happy *Genius* of *this preſent* Age, and the *productions* of it; That a ground of expecting conſiderable things from

from *Experimental* Philoſophy is given by thoſe things which have been found out by *illiterate Tradeſmen*, or lighted on by *chance*; That ſome *peculiar* and *concealed* property of a *natural* thing, may inable the *knowers* of it to perform, with *eaſe*, things, that to others ſeem either not *feiſible*, or not *practicable* without great *difficulty*; That by the *knowledge* and *application* of ſome *unobvious* and *unheeded Properties* and *Laws* of natural things, divers *Effects* may be produced by other *means* and *Inſtruments* than thoſe one would judge *likely*; and even by *ſuch*, as if propoſed, would be thought *unlikely*; That the *knowledge* of *peculiar* Qualities, or uſes of *Phyſical* things, may inable a man to perform thoſe things *Phyſically*, that ſeem to require *Books*, and *dexterity* of hand proper to *Artificers*; That the *uſes* of ſcarce *one* thing in Nature, to Humane Life, are yet *thorowly* underſtood; That a great Inducement to hope for conſiderable matters from *Experimental Philoſophy*, may be taken from the *mutual* aſſiſtance that the *Practical* and *Theorical* part of *Phyſick* may be brought to afford each other; That we are not to make our *Eſtimates* of what may be *hoped* for hereafter, when men ſhall be aſſiſted with the *Hiſtory* of *Nature*, a *method* of

of imploying it, and true *Principles* of *Natural* Philoſophy, and *aſſociated* Endeavours, by what is already *performed* without any of thoſe *Aſſiſtances*. (2.) He hath alſo in a manner promiſed *Eſſays* touching the *concealments* and diſguiſes of the *Seeds* of *living* Creatures. (3.) An *Appendix* to the *Phyſico-Mechanical* Treatiſe concerning the *Air*. (4.) *Something* concerning *Heat* and *Flame*. (5.) The *Sceptical Naturaliſt*, ſhewing the *imperfections* of *Natural Philoſophy* as we *yet* have it. (6.) A Diſcourſe of *improbable Truths*. (7.) The *production* of *Qualities* by *Art*. (8.) *Several uſeful Series* of *Inquiries* and *Directions* of *his*, whereof divers are extant in the *Philoſophical* Tranſactions; as, (1.) *General* Heads for a *Natural* Hiſtory of a *Country ſmall* or *great*. (2.) *Obſervations* and *Directions* about the *Barometer*. (3.) *Inquiries* touching the *Sea*; and, (4.) About *Mines*. (5.) *Quæries* and *Tryals* propoſed, for the improving of that *Grand Experiment*, for the *transfuſing Blood* out of one *live Animal* into another. (6.) *Others* for the finding the Effects of the *Rarifying Engine* exhauſted, in *Plants*, *Seeds*, and *Eggs* of *Silk-worms*. Beſides *Theſe*, he hath a great many other *unpubliſh'd* Inquiries,

es, and *Series* of *Experiments* and *Obser-*
ations of the most considerable parts of
tural Philosophy. As, (1.) About *Pre-*
ous Stones. (2.) *Fermentation*. (3.) *Heat*
nd *Flame*. (4.) An Account of a *new* kind
Baroscope, which he calls *Statical*, and
e advantage it hath above the *Mercurial*.
5.) A *New Experiment*, shewing how a
onsiderable degree of *Cold* may be sudden-
produced without the help of *Snow*, *Ice*,
ail, *Wind*, or *Nitre*, and that at any time
the year, *viz.* by *Sal Armoniack*. (6.) A
ay of preserving *Birds* taken out of the
ggs, and other small *Fœtus's*.

This, Sir, is the Account I received of
hat *Noble* Persons *further* Designs, for the
dvantage of useful Knowledge; and
hough he hath not made an *absolute* Pro-
ise of those Discourses to the Publique,
et he is known to have *such*, and they are
with *probability* expected, since he is *too*
enerous to detain from the *capable* and *in-*
quisitive those his *excellent Discoveries*,
which tend to the *common Benefit*. And
hus I have said what may suffice for gene-
ral Information about the *ROYAL SO-*
CIETY, and the hopes we may justly
conceive of *this Constitution*. And in what
I have discoursed, I have not so much de-

clined

clined from the *proof* of my *undertaking* which was to ſhew the *advantage* that *the latter* Age hath, for the promotion and increaſe of *Knowledge*, above thoſe of former Times: For by deſcribing the *Reaſons* of *Nature*, and ſome of the *Effects* of *the Eſtabliſhment*, I have not *obſcurely* ſuggeſted the Helps that the World hath and may expect from *Them*, for thoſe *Grand* and *Catholick Purpoſes*; and 'tis eaſie to ſee in the very *frame* of this *Aſſembly*, that they are fitted with Opportunities to amaſs together all the conſiderable *Notices*, *Obſervations* and *Experiments*, that are ſcattered up and down in the *wide* World; and ſo, to make a *Bank* of all the *uſeful Knowledge* that is among men. For either by their *whole Body*, or *ſome* or *other* of their *particular* Members, they hold a *Learned Correſpondence* with the greateſt *Virtuoſi* of all the known *Univerſe*, and have ſeveral of their own *Fellows* abroad in *Forreign* Parts, by reaſon of whoſe *Communications*, they know moſt of the *valuable Rarities* and *Phænomena* obſerved by the curious in Nature, and *all conſiderable* Attempts and Performances of *Art*, *Ingenuity*, and *Experiment*. To which conſideration, if you add the *inquiſitiveneſs* of their *Genius*, and the *way* of their *Procedure*,

edure, by *particular* and *cautious Observa-*
ion; the *coldneſs* and *ſhineſs* of their *Aſ-*
ent, and the *numbers* of *judicious* men that
refully examine their *Reports*; I ſay, If
theſe Particulars be weighed, it will appear
o the unprejudiced, That the World had
ever *ſuch* an *advantage* for the *accumula-*
ing a *Treaſure* of *ſubſtantial Knowledge*, as
hath by *this Conſtitution*; (for *ſingle* In-
quiſitors can receive but *ſcant* and *narrow*
nformations, either from their *own Expe-*
ience, or *Converſes*; and *thoſe* they *have*,
re frequently very *imperfect*, or very *miſta-*
en: There is often either *vanity* or *credulity*,
norance or *deſign* in their *Relations*, which
herefore are many times *falſe* in the *main*
natter, and oftner in the *circumſtance*: So
hat the *Hiſtories* of *Nature* we have *hither-*
had, have been but an *heap* and *amaſſment*
f *Truth* and *Falſhood*, *vulgar Tales* and *Ro-*
antick Accounts; and 'tis not in the pow-
r of *particular unaſſociated* Endeavours to
ford us *better*. But now, the frame of
his *Society* ſuggeſts excellent ground to
ope from them *ſincere* and *univerſal Re-*
tions, and the beſt *grounded* and moſt
eful Collection of the affairs of *Art* and
Nature, that ever yet was extant. And
s they have *peculiar* Priviledges for the

gathering

gathering the *Materials* of *Knowledge*, They have the *ſame* for the *impartment* an *diffuſion* of them. And by this time I hop you will acknowledge, That I have mad good alſo what I undertook in *THIS* m *laſt* and *Great Particular*.

CHAP. XV.

The Abſurdity of making Compariſo between the Advantages Ariſtot *had for Knowledge, and thoſe later Ages.*

THus I have ſhewed in *plain* and *m terial* Inſtances, the *vanity* and *wea neſs* of the **Diſputer's** *Affirmation* an belief, That *Ariſtotle* had more *Advantag* for *Knowledge* than all the *later* Ages. An *ſo* I have done with *his Propoſition*: But h Reaſon alſo is to be *conſidered*, and th *was*,

Ariſtotle had *theſe Advantages* above a the World, becauſe he did **Totam pe agrare Aſiam.** How wiſely ſaid an concluded this was, will appear after w hav

have taken notice, that his *Reason* is *defective* both in what it *affirms*, and in what it would *infer*. For the *first*, 'tis evident, that *Aristotle* and the *Ancients* did not know all *ASIA*; for that part which lay beyond the River, was in a manner a *Terra Incognita* unto them: so that they knew scarce any thing of the *Indies* that lie on the other side of *Ganges*, little or nothing of the vast Kingdom of *China*, nothing of *Japan*, or the numerous *Oriental Islands*, besides the defects in the ancient *Geography*, noted above; and these made a *great* if not the *best* part of *Asia*; of which though *Aristotle* might have *heard*, yet we have no shadow of Reason to believe he had any Information from thence. And then I consider,

(2.) That the Account he had from the best *survey'd* Regions, were but from *Hunters*, *Fowlers*, *Fishermen*, and such kind of *Inquisitors*, who were like enough to make *vain* and *mistaken Reports*, and he was fain to depend upon the *credit* of their *Relations*; and therefore his *History* of *Animals* contains many things that are *frivolous*, and many that are *palpably false*. To which I add,

(3.) The Observation of my Lord *Bacon*,

con, That though *Ariſtotle* made ſome *uſe* of thoſe *Experiments* and *Obſervations* he had from thoſe *Informers*, yet it was after he had *concluded* and *decreed*. For he did not *uſe* and imploy *Experiments* for the *erecting* of his *Theories*: but having *arbitrarily* pitch'd his *Theories*, his manner was to force *Experience* to *ſuffragate*, and yield countenance to his *precarious Propoſitions*. And on this account, the *Great* man ſaith, he was leſs *excuſable* than the *Schoolmen*, who altogether quitted and neglected the way of particular *Induſtry* and *Experiment*. Thus then *Ariſtotle* neither knew all *Aſia*, nor had certain *Relations* of that part thereof, of which he had the beſt Informations; nor did he uſe thoſe he had as he ought; which were enough to bring the **Diſputers** *Reaſon* to *nothing*. But I conſider further, That though theſe things had been otherwiſe, and as much for the *intereſt* of his *Affirmation* as he could wiſh, yet,

(2.) His *Inference* muſt *fail*, ſince the *latter* Ages have a much *larger* World than *Ariſtotle*'s *Aſia*; We have the *America*, and the many *New* Lands that are *diſcovered* by *Modern Navigators*; we have *larger* and more *perfect Geography* even of the *old* World, infinitely more

acquaintance

acquaintance and *better* correſpondence in all the parts of the *Univerſe*, by our *general Traffique*, than the *Ancients*, whoſe *Commerce* was narrow, and knowledge of *remote* Parts conſiſted but in *hearſays* and *doubtful Rumors*. We *have* beſides, *New Heavens* as well as a *New Earth*, a larger and truer proſpect of the World above us. We have *travell'd* thoſe *upper* Regions by the *help* of our *Tubes*, and made *Diſcoveries* more becoming the *Wiſdom* and *Magnificence* of *our Creatour*, and more agreeable to the *appearances* of things, than the *arbitrary* phanſies and conjectures of *Ariſtotle* and his *Schools*. We have a *greater World* of *Arts*, *Inſtruments*, and *Obſervations*, as in all *Particulars* my Diſcourſe hath made good. And what are *Ariſtotle's peragrations of Aſia*, to all *theſe*? To the *great Weſtern Indies*; to the full and clearer knowledge of the *Ancient Lands*; to thoſe *nobler* Accounts we have of the *Heavens*, and *univerſal Nature*; to our vaſt *Improvements* of *Chymiſtry*, *Anatomy*, *Arithmetick*, *Geometry*, *Aſtronomy*, *Geography*, *Opticks*, *Natural Hiſtory*, *Navigation*, and all things elſe of benefit and inſtruction? I ſay, *what* are the *gleanings* of a *few mercenary Hunters*, *Fowlers*, and *Fiſhermen*, over *one* part

of *Asia*, to *these* Advantages? And what are the *Reports* of a *few ordinary Fellows*, and the *Tryals* of a *single Person*, to the learned Inquiries and Endeavours of *many sagacious inquisitive Ages*, and the performances of a *numerous Company* of *deep*, *wary*, *diligent*, and *eagle-ey'd Philosophers*, who have the help of *those* Observations, and the addition of an *infinite number more*?

Upon *these* accounts, Sir, the **Disputer**, you see, will need a great deal of *Logick* to make *any thing* of his *Proposition* or his *Reason*, both of which are very *lame*, and I know not where he can find a *prop* for their feebleness. I shall not therefore imploy *more* force to overthrow such *sickly Reasonings*, that have not strength enough to bear their own weight; but out of *pity* to those *infirmities*, shall let them go without *further* castigations. And I hope you have not so understood me, as if the aim of what I have said *hitherto*, was only to disprove this **Disputer** (which were a *poor* project, and would signifie but *very little*.) But my Design is, by representing the *advantages* and *hopefulness* of the *Modern way*, to kindle an ardour in you towards the *generous Experimental Researches*, to vindicate *Philosophy* from the *imputation*

tation of being *notional* and *unprofitable*, and to keep you from adhering to that which is *so*, and hath been the occasion of the *scandal*. And as for *those* that yet stick *there*, I have some things to observe concerning the *Reasons* of their *Devotion* to that *aiery disputative Philosophy*, and their *Enmity* to the *Practical*.

Chap. XVI.

The Reasons *of some Mens* Superstitious *Adherence to the* Notional *way; and of the Disputer that gave occasion to this Discourse.*

I Consider then, That *easie Youth* in its *first addresses* to Learning, is perfectly *passive* to the *Discipline* and *Instructions* of its *Teachers*, whose *Documents* are *promiscuously* received with ready submission of Understandings, that *implicitely* depend on *their Authority*. We suck in the first Rudiments as we *do* the *common Air* [*facili hausti*] as my *Lord Bacon* expresseth it, *without discrimination* or *election*, of which indeed

our tender and unexerciſed minds are not capable. And, I confeſs, 'tis *neceſſary* we ſhould do ſo; nor were there any hurt in this *innocent* eaſineſs, did not moſt men *all their lives* worſhip the *firſt* thing they ſaw in the *morning* of their *days*, and *ever after* obſtinately adhere to thoſe unexamined Receptions. But *this* is the *miſchief*, we infinitely *believe every thing* when we are *Children*, and *moſt* examine little when they are *Men*, but *ſettle* in their *firſt impreſſions*, without giving themſelves the *trouble* to *conſider* and *review* them. And *theſe prejudices* by *cuſtom* and *long acquaintance* with our Souls, get a *mighty* intereſt, and ſhut them againſt every thing that is of a different colour from thoſe *Images of Education*. This is a *general fault* and *infirmity* of *humane Nature*, and from hence it comes to paſs, that the tutour'd *Youth* ſlides *eaſily* into the belief of the *firſt Principles* of *Philoſophy*, which they are taught, and are confirm'd in them by their *Exerciſes* and *Diſputes*, and *Books* and *Converſes*: By *theſe* their *Underſtandings*, which *before* were *White-Paper*, are *dyed* and *deeply tinctured* by the colour they have *imbibed*; And *theſe infuſions* inſenſibly grow as 'twere into the very *ſubſtance* of the Mind, and are upon

upon *all* occaſions *appealed* to as its *unprejudiced, unſophiſticate Dictates.* So that having ſpent ſome time in *learning* and *trimming* thoſe Notions, *the moſt* divert to *Buſineſs* or *other* Studies, without troubling themſelves with any more *Philoſophical* purſuits; but being ſatisfied with *thoſe Notices* which their *firſt* Education lodg'd in their Minds, they ſeek no *further*, nor do care to be *wiſer* in thoſe matters, than they were in the *diſputing infancy* of their Knowledge.

All this while no other *hurt* is *done*, but that men thus are injurious to *themſelves*, and hinder their *own* Improvements. But 'tis *much worſe* when they fondly *fix theſe* as the *Pillars* of *Science*, and would have no body *elſe* go further than their *lazineſs* or their *cares* will permit them to travel; but *rail* ſpightfully at *all* Endeavours for the advancement of *Philoſophick Wiſdom*, and will be angry with every one that hath outgrown his *Cherry-ſtones* and *Rattles*, ſpeak evil at a *venture* of things they know not, and like *Maſtives* are *fiercer* for being kept *dark*. Theſe are the great Enemies of the *uſeful, experimental Methods* of *Philoſophy*: They take it ill that *any* thing ſhould be accounted valuable, in which they are un-

inſtructed, being loth to *learn* in an Age wherein they expect to *Dictate*; and the *Satyriſt* hath told them another reaſon.

—Turpe putant parere minoribus, & quæ
Imberbes didicêre, ſenes perdenda fateri.

I will not ſay how much of *this* I take to be the caſe of our **Reverend Diſputer**; only this, He imployed his *younger* Studies upon the *Philoſophy* of *Diſputation*, and, 'tis like, gained an ability to out-talk *many* of his *Contemporaries* in *that* way. He *confirm'd* himſelf in theſe *Notions* by inſtructing *others* in them, and upon *theſe* Foundations hath built himſelf the Reputation of a *great Scholar* and a *Diſputant* among his *Country-Admirers*. So that you are not to wonder that he is *vehemently* diſpleaſed with the *ROYAL SOCIETY*, and *Experimental Philoſophers*, ſince their Deſigns take away the *honour* of his *Craft*, and in *this way* he is upon the ſame *level* with thoſe that are *but beginning*; the thought of which muſt needs be diſtaſteful to a *ſelf-aſſured* and *imperious* mind. And yet becauſe you ſhall not think that I ſay any of this out of envy to his Fame, I ſhall do him all the right I can, by acknowledging,

That I take him for a Perſon that under-

ſtands

ſtands the *Quiddities* and *Hæcceities*, the *Præciſiones formales* and the *Objectivæ*, the *Homogeneities* and *Heterogeneities*, the *Catagorematice's* and the *Syncatagorematice's*, the *Simpliciter's* and the *ſecundum Quid's*. He knows, no doubt, that *Firſt Matter* that is neither *Quid*, nor *Quale*, nor *Quantum*; and that *wonderful Gremium materiæ*, out of which *Forms* were *educed* that were *never there*. He can tell you fine things of the *fiery* Element under the *Moon*, and the *Epicycles* of the *Stars*; Can reſolve *all Queſtions* by the *compendious* way of *Formaliter*, *Materialiter*, *Fundamentaliter*, and *Eminenter*; Tell you the *difference* between *Quodam modo* and *Modo quodam*, and ſhew the cauſes of all things in *Sympathy*, *Antipathy*, *Combination* of the *Elements*, and *Influences* of the *Heavens*. He *ſees* clearly by his *Spectacles*, That the *Milky-way* is but a *Meteor*, and *Comets* only *kindled Vapours*, in ſpite of the *contrary* information of the *deceitful Teleſcopes*. He can, no doubt, diſpute roundly about the *compoſition* of *Entia rationis* and *Univerſals*, the *Prædications* of *Genus* and *Species*, and the *manner* of their *conſervation* in *Individuals*; of the number of the *Prædicaments*, and *what* Being is in *this*, and *what* in another; of the *inherence* and *pro-*

pagation of *Accidents*, the *real* eſſence of *Relations*, the *nature* of *Ubi* and *Quando*, and a thouſand other *Logical* tricks about *ſhuffling* and *ordering Propoſitions* and *forms* of *Syllogiſm*. In *Phyſiology* he can diſcourſe of the *nakedneſs* of *Firſt Matter*, the *eduction* of *Forms* out of its boſom; ſhew, that the *want* of a *Being* is a *Principle* of *it*, how *forms* of *Elements* are *refracted* in *mix'd Bodies*; Diſpute ſubtilly about the *Primum incipiens* in *Motion*, the *inſtantaneouſneſs* of *Generation*, the *Maximum quod ſic*, and the *Minimum quod non*, and infinite more of ſuch *wonderful*, uſeful, ſignificant Speculations. And in the *Metaphyſicks* I acknowledge him in the words of the incomparable Droll;

He knows what's what, and that's as high
As Metaphyſick Wit can fly.

Theſe, and *other* ſuch *profundities*, are ſome of the *main* things of that *Philoſophy* to which our **Diſputer** is ſo *zealous* a Votary. But for the *Mechanick*, that attempts *material* and *intelligible* Accounts of things, and is in its *grounds* much *ancienter* than that of *Ariſtotle* which he admires, for the *Experimental* Methods and *late* Improvements

ments of *uſeful* Knowledge; as for *theſe*, I ſay, I had no reaſon to judge by his Diſcourſe that he had *any acquantance* with them; nor doth he, as far as I can perceive, *pretend it*: But having it ſeems concluded, That nothing more was to be *known*, than he *knew*, when he *diſputed* in the Schools, he hath *ſate down* ever ſince, and *hugg'd* himſelf in his own *Omniſcience* and *Infallibility*, without caring to be *informed*, what the *inquiſitive* World hath been *doing* in this *late Age* of *Inquiry*. And if it be any thing more than what he hath underſtood in his *Circle* of *Diſputations*, 'tis *phantaſtical* and *unprofitable*, and not worthy his *care* or *notice*, which is very *prudently* concluded; For if it ſhould be otherwiſe, the **Diſputer** would loſe the credit of his *Superlative* Learning.

CHAP.

Chap. XVII.

Of the Peripatetick Philoſophy, *and* Ariſtotle, *as he concerns the* Univerſities.

And on this occaſion, Sir, I obſerve the *incompetency* of *their judgements* who are *Enemies* to the *Real Experimental Philoſophy*, in that they do not (as I intimated) *at all*, or *very little*, *underſtand* what they *condemn*. This I have ſome reaſon to ſay, ſince in the whole *compaſs* of my Acquaintance, which is not very *narrow*, I profeſs I know not *one* who oppoſeth the *Modern* way, that is not *almoſt totally unacquainted* with it. And on the other ſide, upon the moſt careful turn of my thoughts among my *Philoſophick* Friends, I cannot light on *one* of all thoſe that are *for* the *Free* and *Experimental Procedure*, but who have been very well inſtructed in the *Peripatetick Doctrines*, which they have deſerted, and *moſt of them* much *better* than thoſe who are yet *zealous Contenders* for them.

And

And for my *own* part, I must confess, that in my *younger* and *Talkative* Age, I was much delighted with those *subtilties* that exercise the Brain in the *niceties* of *Notion* and *Distinctions*, and afford a great deal of *idle Imployment* for the Tongue in the *Combates* of *Disputation*: In which I acknowledge I was none of the most *backward*, but being highly pleased with those engagements, I found as much diversion in them, as in my deerest Recreations: Yea, and in this *Recital* methinks I feel a kind of *sweet relish* upon my mind, of those *past Complacencies*. But after I had spent some years in those *Notional* Studies, perhaps with as good success as some others, I began to think *CUI BONO*, and to *consider* what *these* things would *signifie* in the World of *Action* and *Business*, I say, I *thought*; but I could find no encouragement to *proceed* from the Answer my thoughts made me: I ask'd my self what accounts I could give of the *Works* of *God* by my Philosophy, *more* than those that have *none*, and found, that I could *amaze* and *astonish Ignorance* with *Distinctions* and *words* of *Art*, but not *satisfie ingenious Inquiry* by any *considerable* and *material Resolutions*. I *consider'd* I had got nothing all this

this while, but a certain *readineſs* in talking, and that about things which I could not uſe *abroad*, without being *Pedantick* and *ridiculous*. I perceived that *that Philoſophy* aimed at *no more*, than the *inſtructing* men in *Notion* and *Diſpute*; That its *Deſign* was *mean*, and its *Principles* at the *beſt uncertain* and *precarious*; That *they* did not *agree* among *themſelves*, nor *at all* with *Nature*. I *examined* the beſt Records I could meet with about the *Author* of thoſe *current Hypotheſes*, but could not be *aſſured* that *Ariſtotle* was *he*. I ſaw many Reaſons to believe, that moſt of the *Books* that bear *his Name*, are *none* of *his*; and *thoſe that are* moſt *ſtrongly* preſumed to be *ſo*, are mightily *altered* and *corrupted* by *Time*, *Ignorance*, *Careleſneſs* and *Deſign*. I perceived that the *Commentators* and late *Diſputers* had exceedingly *diſguiſed* and *changed* the *Senſe* of thoſe very Writings, and made up a *Philoſophy* that was *quite another thing* from *that* which *thoſe* Books contain. So that by *theſe* means I was by degrees taken off from the *implicit Veneration* I had for *that Learning*, upon the account of the great Name of *Ariſtotle* which it wore. And in the proceſs of my Inquiries, I lighted upon ſeveral excellent Authors, who

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said and *proved* very *evil things* of that *Philosopher* himself; As, That he was *impious* in his *Life* and *many* of his *Doctrines*, a *Persecutor* of the *most venerable Sages*, and *corrupter* of the *Wisdom* of the *Ancients*; That he was of no such *superlative* account in the *wisest* Times, but much *opposed* and *slighted* by the *First Fathers*; That he grew into his *Magisterial Authority* by *chance*, in *Times* of *blackest Ignorance*, and held an *unjust Empire* over the free-born Minds of Men, who since they are *enlightned* by the *Rays* of the *glorious* Gospel, have less reason to bow down to the *Dictates* of an *Idolater* and an *Heathen*. I say, I found *these things*, and *many more*, urged against the *School-Philosopher*, by men of great Learning and Name. Nor could I ever light on any thing in his most *devoted* Admirers, that tended to the answering or disproof of any of those *grand Accusations*, most of which seemed to me to have too much evidence, to be easily disabled; not to mention how many Reasons I saw my self for the *worst* of those *Characters*, in the Books that are ascribed to him, if *really they are his*.

These things then I *ponder'd*, and in the *heat* of my Thoughts, and a *youthful* Indignation,

dignation, I drew up the *Charge*, and *gave in* the full of those *bold Accounts* to the *Publick*, in a *Letter* about *Aristotle*, which perhaps you will not do amiss to *consider*. Thus the great *impediment* was removed, and the prejudice of *Education* overcome, when I *thought* further, That *useful* Knowledge was to be look'd for in *God's great Book* the *Universe*, and among those *generous* Men that had converst with *real* Nature, *undisguised* with *Art* and *Notion*. And still I saw *more* of the *justice* of the excellent *Poet*'s Censure of the *Sons* of *Aristotle*, when he saith,

They stand
Lock'd up together hand in hand:
Every one leads as he is led,
The same bare path they tread,
And dance like Fairies a phantastick Round;
But neither change their Motion, nor their
(ground.

From *this Philosophy* therefore, and *these Men*, I diverted my *eyes* and *hopes*, and *fixt* them upon *those Methods* that I have recommended, which I am sure are liable to none of those *Imputations*.

And here I think fit to add a Caution which I have given in another Discourse, and do it once more to prevent a dange-

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rous miſunderſtanding, *viz.* [And it is, That I have ſaid nothing of this to diſcourage *young Academians* from applying themſelves to thoſe *firſt* Studies which are in *uſe* in the *Univerſities*. Their *Statutes* require *Exerciſes* in *that way* of *Learning*; and *ſo much* knowledge of *it*, as inables for *thoſe Duties*, is *requiſite* and *fit*. Nor do I *deny*, but that *thoſe Speculations* raiſe, *quicken*, and *whet* the *Underſtanding*, and on that account may not be altogether *unprofitable*, with reſpect to the more *uſeful Inquiſitions*; provided It keep it ſelf from being *nice*, *aiery*, and *addicted* too much to *general* Notions. But *this* is the *danger*, and the *greateſt part* run upon the Rock. The *hazard* of which might in great meaſure be avoided, if the *Mathematicks* and *Natural Hiſtory* were mingled with *theſe other Studies*, which would indeed be excellent *Preparatives* and *Diſpoſitions* to *future* Improvements. And I add further, that the *young Philoſophers* muſt take care of looking on their *Syſtematick Notions* as the *bounds* and *perfections* of *Knowledge*; nor make account to *fix eternally* upon *thoſe Theories*, as *eſtabliſh'd* and *infallible Certainties*: But *conſider them* in the *modeſt ſenſe* of *Hypotheſes*, and as *things* they are

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to take in their paſſage to *others* that are more *valuable* and *important*. I ſay, the *Peripatetick Studies* thus *temper'd*, will not, I ſuppoſe, be *diſallowed* by the men of the *Practical Method*; and ſo the *Univerſity-Eſtabliſhments* can receive no prejudice from the *Spirit* that diſlikes a *perpetual acquieſcence* in the *Philoſophy* of the *preſent* Schools.

Chap. XVIII.

Some things elſe debated by the Author with the Diſputer, *about the* Prophets *and the* Scriptures. *The* Imagination *was ordinarily the* immediate *Subject of* Prophetick Influx.

I HAVE now *done* with the *Philoſophical Conſiderations* I intended here, and am ſo fond as to believe, that I have ſaid enough about the *main* buſineſs of our *Conference*; from which the **Diſputer** at laſt ſhew'd an inclination to draw off, and endeavour'd

endeavour'd to engage me in other things that were *aside* and *irrelative* to our Discourse: Particularly, I perceived he made towards the Controversies between the *Calvinists* and *Remonstrants*, and offer'd me several Temptations to fall in there. I knew it was a Design to draw me into his *Road* of *talking*, and consider'd that our *Spirits* were too much *moved*, and our *Time* too *short* for those *deep* and *endless* Debates. And I have long since resolved never to treat with any one about *them*, that is not very *free*, *thoughtful*, *modest*, and *benign*, without which *prædispositions* in the Subject, I know the *clearest* and *greatest evidence* in the World can make no *impressions*. Upon these accounts I declined the bait; but in the process of our *rambling* Talk, was insensibly led into a Discourse as *extrinsick*, which was concerning the *Method of the Scriptures*. About *this* I said,

That those Holy Oracles were not written methodically; Meaning, not according to the *Rules* of *our Methods*; especially I instanc'd in the *Prophetick Writings*, which are very

little ſuted to the *ways* of our *Order*. And in conſequence of *this*, I affirmed, *That God was pleaſed in thoſe Inſpirations to apply himſelf much to the Imagination of the Prophets*; which *Faculty*, I ſaid, was *deſultory*, and did ſeldom *tie* it ſelf to *ſtrict coherence*. This was the *ſum* of *all* from whence the **Diſputer** took occaſion for *loud* out-cries. He told me, [**That my Affirmations were Atheiſtical; That God was the God of Order, and not of Confuſion; and dealt with the nobleſt Faculty, which is the Underſtanding**] I was aſtoniſh'd at the haſte of the *wilde* and *groundleſs Cenſure*, and *anſwered* to the *Argument*, That he might as well *conclude*, That all the *Blades of Graſs, and Flowers of the Field, ſhould be placed in Knots, and a Garden-order, and the Stars ſet in Rank and File, becauſe God is the God of Order*, as the other Propoſition he would infer.

I ſaid there was no doubt but that the Divine Wiſdom, which had made all things in *Number, Weight, and Meaſure*, had

had an *Order* and *Idea* to it self, according to which it framed them: But then I added, That as *his ways* were *above ours*, so were many of the *Methods* of his *Working besides* them; and consequently, I thought it somewhat too bold and *presumptuous* to bring down *Infinite* Wisedom to *our Rules*, upon that score reproving the Custom of some *Formal Preachers*, who spend *much* pains to *little* purpose, in finding long *Series* of *connection*, where many times *none* were intended.

This is the whole substance of what I said in this Affair, and at this *period* of the Conference the **Disputer** lost all patience, and with sufficient *spight* and *rage* told me, **That I was an Atheist**; That he had indeed desired my Acquaintance, but would have no more on't; and so turn'd his back, and went away, giving me time only to *Answer*, *That I had no great reason to lament the loss of an Acquaintance that could be so easily forfeited.* Thus, Sir, you have the *sincere* Account of those *Sayings*, about which the **Disputer** hath raised such *Tragical* Stories. In them he hath accused me of *Atheistical Assertions*, and affirmed that I said, **The Scripture was only written to mens phansies:**

Which *Propoſition* he hath *ſo* ordered, as that many *impious* abſurdities are deduced from it, and *thoſe* muſt go for my Opinions. When as 'tis ſo far from being *true*, that *that Propoſition* came from me, that I underſtand not what it *means*: Only I can collect from it the **Diſputers** *Wrath*, or *ſomewhat* he would be leſs willing to acknowledge. For either he *really believes* the *Propoſition* he reports, to be the ſenſe of *mine*, or he doth not; If really he *doth*, I cannot *excuſe* his *Underſtanding*; if *not*, I *wonder* at his *Conſcience*. But that I may together *explicate* what I *meant*, and *defend* it, I add a brief account of my Saying, [*That God did much apply himſelf to the Imagination of the Prophets*;] As to which, I obſerve,

That both the *Schoolmen* ond others uſually divide *Propheſie* into *Intellectual* and *Imaginary*. The former is from a Light *immediately infuſed* into the *Underſtanding*; the *latter*, when the *Prophetick Spirit* makes its *firſt Impreſſions* on the *Imagination*, by *ſenſible* and *material Repreſentments*. As for the *Firſt*, it was ſo *rare*, that

that nôt above *one* or *two* Instances are produced by the Learned in the kind, *viz.* *MOSES* and St. *PAUL*. Now commonly the *degree* of *Mosaical Inspiration* was distinguish'd from the *Prophetical*; and the *difference* is plainly enough express'd *Deut.* xxxiv. x. *And there arose not a Prophet since in Israel like unto MOSES, whom the Lord knew face to face.* For the *other* Prophets, God saith, *I will make my self known unto him in a Vision, and will speak unto him in a Dream: My Servant Moses is not so, with him I will speak mouth to mouth*, Num. xxii. v, vi.--- intimating a *transcendent* Priviledge to *Moses* above the *Prophets*, in the *immediate* way of *application* to his *mind*, without the *mediation* of *sensible Impressions*. And upon this account 'tis said in the *New-Testament*, *They have Moses and the Prophets*; implying the difference of the *dignity* and *degree* of their *Inspiration*.

As for the second Instance of St. *Paul*, his case mentioned ii *Cor.* xxii. was *Extasie*, and may be *omitted* in our Discourse that concerns *Prophetick Revelation*; But admitting it, *this* must be granted however, That the *immediate Intellectual* way was very *rare*, and therefore by way of *emi-*

nency and *diſtinction*, 'tis among the Rabbins call'd the *Gradus Moſaicus*.

But for the *ſecond* kind, *viz.* the *Imaginary* and *Senſible*, this was the *ordinary* ſort of *Inſpiration*, and this the meaning of my Aſſertion. That it was the uſual way of *influx* upon the *Prophets*, appears from the mentioned place of *Deut.* xxxiv. *And I will make my ſelf known unto him in a Viſion, and ſpeak unto him in a Dream*; which was moſt evidently fulfilled in the *latter* days of *Propheſie*, when the *Prophetick Illuminations* went much *this way*. It might ſeem ſuperfluous labour to give *particular* Inſtances in *Jeremiah*'s *Boyling Pot*, *his Rod*, *his Basket of Figs*--- In *Daniels Tree* and *Four Beaſts*--- In *Ezechiel*'s *Chariot*, *Wheels*, *Living Creatures*--- and ſuch like, which in the *Prophetick* Writings ſcarce leave a page without example. Now it will not I conceive be denied by any one that underſtands what he *ſaith*, that theſe *Repreſentations* were made upon the *Stage* of *Imagination*, and thoſe *Viſa impreſt* on the *Phancy*. Upon this account it was that the *Enthuſiaſms* of later *Prophets* were much in *Similitudes*, *Parables*, and *Allegories*; and ſo *Ezechiel* complains, *Ah Lord, they ſay of me*,

me, Doth he not speak in Parables? And *a Lapide* gives it for a *general Rule, Prophetarum Visiones & Revelationes communiter fuerunt Sensiles, sive Imaginariæ. Rabbi Albo* calls *Prophesie* an *Influence* from God upon the *Mind* by the *mediation* of the *Phancy*; and *Maimonides* saith, That all the *Degrees* of *Prophesie* are contain'd in those *two*, a *Dream* and a *Vision*; and *Joel* ii. xxviii. mentions these as *comprehensive* of all the *Degrees* of *Prophesie*. But this thing is every where so *clear* in the *Scripture*, in the *Rabbins*, and the Writings of all Learned men that deal in those matters, that I think I need not say much more for proof.

Only I take notice, That 'twas the general belief of the *Jewish* Writers, and of the *Christian Fathers* and *Schoolmen universally*, confirm'd by the *Authority* of *Scripture*, *That Angels were ordinarily the immediate Efficients by whose Ministry the Scene of Prophetick Representations was dresst and order'd.* This hath been evidently proved by the Learned Mr. *Smith*, in his Discourse of *Prophesie*; and from hence I could infer, if there were need of more, That their menage of this Affair doth *reasonably* infer, That the *Imagination* had *such* a *concern* in

it as I affirm. For 'tis generally denied by the Schoolmen, whose *Authority* no doubt is *great* with our **Diſputer** and others, That *Angels* can *immediately imprint Conceptions* and *Apprehenſions* on the *Underſtanding*; which *indeed*, among *other* abſurdities that I omit, would *infer*, That they have that grand Prerogative of the *Omniſcient*, the Καρδιογνωσια, *Knowledge of Hearts*, which the Scripture every where vindicates and appropriates to *God only*. What they do therefore, muſt be by *Phantaſms* and *Idea's impreſt* on the *Phancy*. They are the *Internuncii* and *immediate* Cauſes which preſent the *Prophetick Viſa*; and conſequently, the *Imagination* and *Senſe* are the chief *Stage* of their *Repreſentations*. Now this was done *divers ways*, and the noble *Picus Mirandula* hath collected out of *Maimonides* no leſs than *eleven*, all which he calls *Gradus Imaginarii*, in oppoſition to the *Gradus Moſaicus*, which is the *Intellectual*.

But 'tis not proper for me to inſiſt longer on a thing that is *extrinſick* to the *main* deſign of my Diſcourſe. And it was too

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but the *Conclusion* and *smallest* part of our Conference; Though the **Disputer** (as far as I can hear) *reports* nothing else as the *matter* of our difference, but these two things, about the *Method of Scripture*, and *Gods applying to the Imagination of the Prophets*; either because he is ashamed to own the main Discourse, or else hath a Design to throw the *odium* upon me of *Heterodoxy* in *Religion*. When as indeed these came in but *accidentally*, and we had but a short *Contrast* about *them*, which I have *faithfully related*.

The CONCLUSION.

Containing Observations about the Censure of Atheism, *applied to* Philosophical Men; *and the Authors* Apology *to the* ROYAL SOCIETY, *and other* generous Philosophers.

BY this I believe you see how *little Reason* there was in the *Disputer's* Discourse,

ſcourſe, and how *little Juſtice* in his *foul Imputation*; upon the occaſion of which, if you are not quite tired already, I ſhall by way of *Concluſion* offer you a Remarque or two concerning the *Charge* of **Atheiſm**, of which ſome fierce People are very *liberal.*

About it I take notice, That *Philoſophical* Men are uſually dealt with by the *zealous*, as the greateſt Patrons of the *Proteſtant* Cauſe are by the *Sects.* For as the *Biſhops* and other Learned Perſons, who have *moſt ſtrongly* oppugned the *Romiſh Faith*, have had the ill luck to be accuſed of *Popery* themſelves; in like manner it happens to the *humbleſt* and *deepeſt Inquiſitors* into the *Works* of *God*, who have the *moſt* and *fulleſt* Arguments of his *exiſtence*, have raiſed *impregnable Ramparts* with much *induſtry* and *pious pains* againſt the *Atheiſts*, and are the *only men* that can with ſucceſs ſerve *Religion* againſt the *godleſs Rout*; *Theſe*, *Superſtitious Ignorance* hath always made the loudeſt out-cry *againſt*, as if themſelves were *guilty* of *that* which they have moſt happily *oppugned* and *defeated.* And the certain way to be eſteemed an *Atheiſt* by the *fierce* and *ignorant Devoto's*, is to ſtudy to lay the *Foundations* of

Religion

Religion sure, and to be able to speak *groundedly* and to *purpose* against the *desperate* Cause of the *black Conspirators* against *Heaven*. This I confess hath been one of the chief Imployments of my *time* and *thoughts*; and on this account I reckon, I must be content with my share in the *abuse*, when *greater*, and *better*, and *deeper* men have been *pelted* with this *Dirt*, while they have been labouring in the *Trenches*, and indeavouring to secure the *Foundations* of the *Holy Fabrick*.

But besides I observe, That *narrow*, *angry* People take occasion to charge the *freer Spirits* with **Atheism**, because they move in a *larger* Circle, and have no such *fond adherence* to *some Opinions* which *they adore* and count *Sacred*. And for my own part, I confess I have not *Superstition* enough in my *Spirit* or *Nature*, to incline me to doat upon all the Principles I judge *true*, or to speak so *dogmatically* about them as I perceive *confident* and *disputing* men are wont. But contenting my self with a *firm Assent* to the *few practical Fundamentals* of *Faith*, and having *fix'd that end* of the *Compass*, I desire to preserve my *Liberty* as to the *rest*, holding the *other* in such a posture, as may be ready to draw those *Lines*, my Judgment

ment informed by the *Holy Oracles*, the *Articles* of *our Church*, the *Apprehenſions* of *wiſe Antiquity*, and my *particular Reaſon*, ſhall direct me to deſcribe. And when I do *that*, 'tis for *my ſelf*, and my *own ſatisfaction*; but am not concern'd to impoſe my *Sentiments* upon *others*: nor do I care to endeavour the change of their minds, though I judge them miſtaken, as long as *Vertue*, the *Intereſts* of *Religion*, the *Peace* of the *World* and *their own* are not *prejudiced* by their *Errours*. By this *modeſt* indifference I ſecure *Charity* for all the *diverſities* of *Belief*, and *equally* offer my *Friendſhip* and *Converſes* to the ſeveral *Sects* and *Perſwaſions*, that ſtick to the *plain Principles* of the *Goſpel* and a *Vertuous Life*, overlooking their particular *fondneſſes* and *follies*. This is the *Temper* of my *Genius*, and *this* ſome *warm* Folks, who have more *heat* than *light*, are apt to call *Scepticiſm* and *cold Neutrality*: But that it deſerves *better* names, I have made appear in ſome other Papers; and I have a little Intereſt to remarque further,

That 'tis the *misfortune* of men of *Philoſophical* inclination, where they eſcape the *reproach* of the more *deſperate* **Atheiſm**, at leaſt to meet the *imputation* of a *bordering impiety*,

impiety, the *Contempt* of the *Holy Scriptures*. I am not to anſwer for all the *Pretenders* to *Philoſophy*: but this I can ſay, That thoſe of the *graver* and *better Genius*, have ſuch an apprehenſion of the *Divine Oracles*, as will effectually ſecure them from ſuffering diminution from any *Diſcloſures* in *Nature*: And that is, *That thoſe Holy Records ſpeak for the moſt part in the Language of Senſe, being ſuted to Plebeian Capacities, and intended for Inſtructions in Life and Manners; not for nicer Informations in things of deeper Speculation and Theory.* Upon which accounts they reckon, that we are not to expect from them the *Propoſitions* of *Philoſophy*, nor to *wonder* or be ſtumbled though the *literal* Text do not anſwer *Philoſophical exactneſs*, which is not the *thing* the *inſpired Book intends*. So that whatever *Diſcoveries* are *made* by the *Inquirers* into *Nature*, the *Sacred Authority* ſtands *firm*, while they judge by *this Rule* of *Interpretation*. But of *this* again in a fitter place, at preſent my own Concerns call upon me to ſay ſomewhat for my ſelf; ſince my *enrag'd* **Antagoniſt** hath from our Diſcourſe (how juſtly we have ſeen already) reported me an *Enemy* to the *Scriptures*.

And now one would think it ſhould be very

very *needleſs* and *improper*, that *one* who *Miniſters* in the *eternal* Goſpel, ſhould ſay any *more* than what he doth *twice* every Week in thoſe *Publick* Inſtructions drawn from the *Sacred Volume*, to juſtifie his being no *deſpiſer* of *it*: But there are a ſort of People with whom one *perverſe*, *illogical*, *uncharitable deduction* of their *own* will *ſignifie more*, to faſten an *odious* thing upon him that diſſents from them, than a thouſand profeſſions of *his* to the *contrary* can do to clear him from the *malicious* Charge. For *ſuch*, 'tis an happy turn that we are to be judged by a more equal *Tribunal* than *theirs*, and they would be loth to be *tryed themſelves* by *ſuch* Meaſures. Were theſe the only Perſons I have to deal with, I ſhould ſpare my ſelf *theſe* pains; for I know, *what I write* will not be more *plain* and *credible* than *what I ſay*. But *others* are to be conſider'd, of more *Chriſtian* and *candid* tempers, upon whom *envious* Traducers may faſten ſome *odd thoughts* and *ſuſpicions*: To ſuch I declare, That in my firſt *Education* I was continually inſtructed into a *Religious* and *faſt adherence* to every thing I was *taught*, and a *dread* of *diſſenting* in the *leaſt Article*. This Diſcipline I underwent in my *younger days*, and thought very

very *strangely* of *those* that believed any thing *different* from the *Opinions* of my *Instructors*. But advancing in years, and coming to a *freer* exercise of mine own mind, I began to make *Reflexions* upon the vast *diversities* and *variety* of *Apprehensions* and *Religions* in the World; I consider'd, That they were all as *confident* in *their way*, as I in *that* wherein I was *instructed*; and the *greatest* part had nothing but their *Education* for their *inducement*. I thought how easie we are in our *first* Age; and that though *Children* must *believe*, yet *Men*, especially *those* bred in the way of *Study*, must *Try*. I consider'd what I should first advise an *Heathen* or *Mahometan* to *do*, who had been bred up to *Idolatry* and *Fables*; and upon the consult with my self, *concluded*, That it should *be* to look about him, and to *examine* other Religions, regarding his *own* with the same eye of *indifferency* and *suspension*, as if he had never been born under *that Faith*, which was a thing *extrinsick* and *accidental*, and therefore not fit to make an *Argument* to ingage a *reasonable* belief; and when I had so thought, I turned the *Tables*, and took the *same* Counsel *my self*.

I therefore bent my chief Studies and Endeavours

Endeavours to know the *Truth* of the *Chriſtian Faith*; and after the *Foundations* laid, in the ſettling the grand *Article*, The *BEING OF A GOD*, and the *conſequent* Doctrines of *Natural Theology*, I ſate me down to inquire about the *Authority* of the *Holy Scriptures*; not that I poſitively *doubted* or *diſtruſted* their *veracity*, but that I might have a *firm* bottom, and be able to give an account of my *Faith* and *Hope*. In my Inquiry, the firſt Diſcourſes I met with on the Subject did not at all *ſatisfie*, but ſeemed weak and hugely *obnoxious*: But in the progreſs of my ſearch, I lighted on thoſe grounds which (I thank God) *quieted* my *mind*, and gave me the moſt *Demonſtrative aſſurance* that the nature of the thing could *bear*, of the truth and certainty of thoſe *Sacred* Writings, which undoubtedly contain the *fulleſt Diſcoveries* of the *Divine Wiſdom* and *Perfections*, which I *infinitely* admire; and ſhall *eternally* adore that Goodneſs that bleſt the Sons of men with ſuch clear Diſcoveries of his Will. And though I perceive that the *Follies* and *Superſtitions* of *Sects*, who have the *Holy Oracles* always in their mouths, and *preſs* them for the Service of their conceits, have prejudiced ſome of the pre-

tenders

tenders to Reaſon againſt them; yet this I ſee, That the *wiſer*, *freer*, *better*, and more *reaſonable* any man is, the greater ſtill is his *Veneration* of thoſe *Holy Records*, and the reliſh of them increaſeth with our Improvements in *Vertue* and *Goodneſs*. This Teſtimony I muſt give here, and more I have to ſay in another place.

And now I had ended your trouble, but that upon the caſt of my thoughts back I have conſidered, that my main buſineſs being the *Recommendation* and *Advancement* of the *Modern Uſeful Knowledge*, I need make an *Apology* to the generous Friends of *that way*, and particularly the *ROYAL SOCIETY*, for my Diſcourſe of *Them*, and thoſe their *great* Deſigns, in a Treatiſe that contains matter of *difference* and *conteſt*, which are ſo *fundamentally* contrary to their *Spirit* and *Endeavours*; and it may perhaps be feared, that ſome will take occaſion hence to look on the *Neoterick Philoſophers* as but a *new ſort* of *Diſputers*. To which I ſay, That for my publick appearance in a *Controverſie*, I have already given ſuch an Account, as *may*, I hope, *ſatisfie* the *Candid* and *Ingenious* of the *neceſſity* that inforced it; and for the apprehenſion of raiſing *mean* and *injurious*

thoughts of the *Practical Philoſophers*, by *defending* them in a Book of *Difference*, I hope it is cauſeleſs, ſince I have from firſt to laſt repreſented their Aims and Deſigns as things very *different*, yea perfectly oppoſite to that Spirit and Genius; and I ſhall now for a cloſe aſſure you again, That there is nothing tends more to the undermining and ſupplanting the *humour* of *Diſputing*, than (the *Experimental* and *Free Philoſophy*. For this *inlargeth* the Mind, and gives it a *proſpect* of the *vaſtneſs* of things, and the *imperfections* of our *Knowledge*, the *Difficulties* that are to be incountred in the ſearch of Truth, and our *liableneſs* to *deception*, the *ſtumbles* of *Confidence*, the *prejudices* of *Education*, the *ſhortneſs* of our *Senſes*, the *precipitancy* of our *Underſtandings*, and the *malign influence* of our *Affections*; I ſay, the *Free* and *Real* Philoſophy makes men deeply ſenſible of the infirmities of humane Intellect, and our manifold hazards of *miſtaking*, and ſo renders them *wary* and *modeſt*, *diffident* of the *certainty* of their *Conceptions*, and averſe to the *boldneſs* of *peremptory aſſerting*. So that the *Philoſopher thinks much*, and *examines* many things, ſeparates the *Certainties* from the *Plauſibilities*, *that* which is *preſumed* from

from *that* which is *prov'd*, the *Images* of *Senſe*, *Phanſie*, and *Education*, from the *Dictates* of *genuine* and *impartial Reaſon*. Thus he doth before he *Aſſents* or *Denies*; and *then* he takes with him alſo a Senſe of his own *Fallibility* and *Defects*, and never concludes but upon reſolution to alter his mind upon contrary evidence. Thus he conceives *warily*, and he ſpeaks with as much *caution* and *reſerve*, in the humble Forms of [*So I think*, and *In my opinion*, and *Perhaps 'tis ſo*—] with great differrence to *oppoſite* Perſwaſion, candour to *diſſenters*, and *calmneſs* in *contradictions*, with *readineſs* and *deſire* to *learn*, and great delight in the Diſcoveries of Truth, and Detections of his *own* Miſtakes. When he argues he gives his *Reaſons* without *paſſion*, and *ſhines without flaming*, diſcourſes without *wrangling*, and *differs* without *dividing*. He catcheth not at the *Infirmities* of his *Oppoſite*, but lays hold of his *Strength*, and weighs the ſubſtance without blowing the *duſt* in his *eyes*. He entertains what he finds *reaſonable*, and *ſuſpends* his judgment when he doth not clearly *underſtand*. This is the Spirit with which men are inſpired by the Philoſophy I recommend. It makes them ſo *juſt*, as to

allow that liberty of judgment to *others*, which *themſelves* deſire, and *ſo* prevents all *imperious Dictates* and *Impoſings*, all *captious Quarrels* and *Notional Wars*. And that this is the *Philoſophick* Genius, may be ſhewn in a *grand* Inſtance, the *ROYAL SOCIETY*, which is the *Great Body* of *Practical* Philoſophers. In *this Aſſembly* though it be made up of all kinds of *Diſpoſitions*, *Profeſſions*, and *Opinions*; yet hath *Philoſophy* ſo rarely temper'd the *Conſtitution*, that thoſe that attend there, never ſee the leaſt inclination to any unhandſom *oppoſition* or uncivil *reflexion*, no bold *obtruſions* or confident *ſayings*. The forbearing ſuch Rudeneſſes is indeed a *Law* of *that Society*, and their Deſigns and Methods of Inquiry naturally form men into the *modeſt* temper, and ſecure them from the danger of the *quarrelſome* Genius. This is palpable evidence of the *ſweet* humour and *ingenious Tendencies* of the *Free Philoſophy*; and I believe 'twill be hard to ſhew ſuch another Example in any ſo great a Body of *differing Inclinations* and *Apprehenſions*. Thus the *Experimental Learning* rectifies the *grand abuſe* which the *Notional* Knowledge hath ſo long foſter'd and promoted, to the *hinderance* of *Science*, the *diſturbance* of

of the World, and the prejudice of the *Christian Faith.* And there is no doubt but as it hath altered and reformed the *Genius* in matters of natural *Research* and *Inquiry*; so it will in its progress dispose mens Spirits to more *calmness* and *modesty*, *charity* and *prudence* in the Differences of *Religion*, and even silence *Disputes* there. For the *free sensible* Knowledge tends to the altering the *Crasis* of mens minds, and so cures the *Disease* at the *root*; and *true Philosophy* is a *Specifick* against *Disputes* and *Divisions.*

Thus I might run out into a large Discourse on this Subject; but I have said *enough* for my *present* purpose, and I doubt too *much* for your *patience*; and therefore I shut up with the assurance of my being,

SIR,

Your faithful Friend

and Servant,

JOS. GLANVILL.

ERRATA.

PAge 26. line 6. for *Philophy* read *Philoſophy*. p. 30. l. 11. for *Elipſis* r. *Ellipſis*. Id. *l.* 19. p. 33. l. 18. for *adſerted* r. *affected*. p. 39. l. 5. r. *Anaximenes*. p. 43. l. 16. r. *one*. Id. *l.* 24. r. *Chriſtophorus*. p. 65. l. 26. r. *Vegetables*. p. 133. l. 24. r. 2 *Cor.* xii.

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